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THE SIGNIFICANCE OF THE TEMPERATURE IN TUBERCULOSIS.

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We do not hear, to-day, as much of the "pathognomonic" symptom as we did a few years ago, for with increasing knowledge of disease has come the realization that a symptom is seldom, in a strict sense, pathognomonic—that is, limited to a single disease. This discovery, however, does in no way detract from the value of symptoms of a general nature, for as a result of a more intensive study of these symptoms we have learned that while in no sense specific, a symptom may have such definite and distinguishing characteristics as to render it in certain diseases almost as individual as a thumb-print. Thus a rise of temperature is a symptom of a most general nature, yet it is always a symptom of significance, while special importance attaches to it in certain diseases—I have but to instance lobar pneumonia, in which the temperature is very characteristic. In many other diseases, while such a degree of specificness may not be met with, the study of the temperature may be made to yield considerable information of a positive nature if we note such characteristics as the height and course of the fever, its daily excursions, its association with other symptoms, relation to treatment, and the like. Particularly is this so in chronic pulmonary tuberculosis, in which disease fever, whether from the view-point of diagnosis, prognosis, or treatment, is the most important single symptom that we possess.

I have, therefore, thought it worth while to assemble in this brief paper such facts as bear on the subject of fever in chronic pulmonary tuberculosis, paying especial attention to the value of this symptom as a diagnostic sign, a prognostic guide, and a therapeutic index. The temperature of tuberculosis, therefore, has a triple aspect, and its common occurrence, its early appearance, and its (frequently) dogged persistence all contrive to make it the sovereign symptom of the disease.

With regard to the incidence of fever Cornet states: "Exceptionally chronic cases occur, especially in the fibrous form, which run their course without any notable degree of fever, even to a fatal termination. As a rule, however, the course of the disease, and at times even the earlier stage, is associated with a variable degree of fever."[1] Minor, in discussing this symptom, says: "It gives one of the earliest evidences of the activity of the bacillus, and while some have maintained that simple, uncomplicated tuberculosis is afebrile, the consensus of medical opinion is against such a contention."[2] While Calmette believes that "in general the thermic equilibrium is disturbed in tuberculous individuals before any other manifestation makes its appearance."[3]

From what has been said it will be evident that fever, by reason of its frequency and its timely appearance, is one of the most valuable signs we have in the early diagnosis of tuberculosis. Before entering

into this phase of the subject it may be well to devote a few words to the character of the temperature of tuberculosis. And here I may venture to say that there is no temperature *typical* of tuberculosis in the sense that there is in certain other diseases. "In phthisis the fever follows no definite type, . . . but is characterized by irregular variations and changes of character corresponding to the interrupted progression of the disease."[2] All types are met with—the remittent, the intermittent, and, occasionally, the continuous—the character of the fever varying in different individuals and in the same individual at different times. The temperature curve is affected not only by the activity of the local lesion, by the involvement of new areas, but the heat-regulating center is so influenced by somatic suggestions received from different parts of the economy that a short walk or a game of cards is, in many instances, sufficient to cause a rise of considerable degree. Extreme variability, therefore, is perhaps the chief characteristic of the temperature of tuberculosis. In an attempt to classify the different types Cornet has evolved the following scheme:

(1) Slight elevation or *febricula intermittens;* (2) a somewhat higher temperature, ranging, roughiy, between 100° and 102° F., *febris intermittens,* returning to normal, or *febris remittens,* showing a fall of two degrees; (3) fever above 102.2°, *perfebris intermittens* or *remittens;* (4) fever of considerable height with remissions below normal, *hypo-hyperpyrexia;* (5) high fever with only slight daily variation, *febris* and *perfebris continua;* (6) *typus inversus,* a rare form in which the exacerbation takes place in the morning. While these different types comprehend the various temperature excursions met with in tuberculosis, the fever in any given case will vary greatly from any one of the types of the above classification.

Thus in the early stages we shall not expect any great degree of fever, the temperature usually not beginning to rise until some time after noon and not going above 99.4° or 99.6° F. as a rule (sometimes not above 99.2°), reaching its maximum in the late afternoon and quickly falling to normal. There may be associated with the fever a slight headache and that indescribable sensation of "feeling feverish;" or the presence of fever may be suggested to one's friends or family by the flushed face and glistening eyes of the patient. More commonly, perhaps, the fever exists for some time without giving either subjective or objective evidence of its presence. This early token of tuberculous activity is so transient and so capricious, lasting but a few hours, being present one day and absent another, that frequent and continued observations are necessary in order to detect it. The practice of taking the temperature, in suspicious cases, only three times daily cannot be too strongly condemned, for if this method is followed a slight and temporary rise can very easily be overlooked. To avail ourselves of this most valuable diagnostic hint the temperature must be taken at two-hour intervals and should be recorded. Such a procedure will often bring to light an unsuspected fever, but as this fever may be absent for a day or for several days it may be necessary to persist in the diagnostic use of the thermometer for several weeks. Again, it may happen that a rise of temperature takes place during the night and is unsuspected until the thermometer reveals its presence.

The technique of fever measurements is familiar to all. Some authors assert that rectal temperatures are more dependable, claiming that the temperature of the mouth is affected by the surrounding air and that it therefore gives no trustworthy information as to the actual body temperature. While these objections may be theoretically valid, the difficulty and the unpleasantness of rectal measurements in ambulant cases must not be overlooked, and those who have practiced the taking of the temperature *per os* have found it very satisfactory on the whole. But in order to obtain the requisite degree of accuracy the thermometer must be held in the mouth a full five minutes, no talking to be allowed during this period and the mouth to be firmly closed.

If these conditions be fulfilled, the mouth temperature except outdoors in very cold weather will be found to give a reliable index of the degree of fever.

I have said that systematic observations will commonly reveal in the early stages of tuberculosis a slight rise of temperature during the course of the afternoon. Concurrent with this rise, or more properly, actually foreshadowing it, there is present a subnormal morning temperature. To make certain of the latter, however, the temperature should be tested immediately after wakening and before the patient has risen; for soon after he has gotten up, dressed, and walked about the temperature will have risen to normal. In healthy persons the early morning temperature does not go below 97.8° F. except in very cold weather, while in the tuberculous it may fall short of this minimum by about one degree. This morning subnormal temperature is more persistent than the evening rise, the latter giving way—with improvement of the case—long before the morning temperature has risen to normal. Both of these signs are valuable aids in the recognition of early tuberculosis.

As has already been noted, temperature variations are symptoms of a most general nature, and it is not to be wondered at if other affections exhibit slight degrees of fever similar to those of incipient tuberculosis. Among these we may mention malaria, which is not uncommonly mistaken for tuberculosis. A moderate degree of temperature elevation is frequently the result of malarial infection, but the character of the fever is somewhat different from that of tuberculosis, the rise being more sudden in malaria and usually attaining a greater height; the presence of a chill aids in making the diagnosis, and a microscopic examination should always be resorted to to confirm it. In other cases hyperthyroidism may be the pyretogenous agent. Slight fever with pulse acceleration, nervous symptoms, a cough, and moderate loss of weight, without visible swelling of the neck and with eyes not unduly prominent, an abortive case of Graves's disease, may mimic tuberculosis with great fidelity. In still other cases a remittent or intermittent fever may be the imprint of the cloven hoof of syphilis. In all of these conditions there are usually associated phenomena which enable one to determine the foundation upon which the fever rests.

In other affections, however, a differential diagnosis is not so readily made. Thus chlorosis with a little fever may appear the exact counterpart of incipient tuberculosis; and "slight variations of the central normal temperature, usually in an upward direction, are frequently observed in pure neurasthenic states,"[4] the clinical picture of which may so strongly resemble tuberculosis as to seem but an *alter idem*. We should be doing the patient a great injustice and putting him to a loss of considerable time and money if we should hazard a diagnosis of tuberculosis in such cases. On the other hand, both of these conditions—the anemia and the neurasthenia—may be the result of tuberculosis of the lungs, and, lest we work a greater injury to our patient, we should be very chary of excluding this disease as a possible source of the symptoms, remembering in the words of Burke that "an early and provident fear is the mother of safety." Perhaps when all has been said, we shall not be far from the truth if we accept Calmette's dictum that "the irregularities of temperature, observed after alternations of slight fatigue and repose in persons normally fever-free, indicates a functional disturbance of the nutrition, which, in the majority of cases, is associated with beginning tuberculosis."

Having thus briefly considered the temperature of incipient tuberculosis, we shall glance for a moment at its behavior in somewhat more advanced stages. As the disease progresses the presence of fever is more evident and its detection more readily accomplished. The rise takes place earlier in the day and the fall to normal is delayed until 8 P.M. or later. The maximum is also higher, the temperature reaching 100° or 101° F. With a considerable amount of tissue destruction and the formation of cavities the temperature com-

monly rises during the morning and lasts well into the night, with a maximum of 101° F. and over; some cases may reach 103° F. or higher. A double or a triple rise may occur. In late stages with large cavities and deficient drainage we meet that type known as *hectic* and characterized by a temperature abnormally low in the morning, but which in the evening scales the heights of 103° to 104°. In some advanced cases we get the *typus inversus*, mounting in the morning to a considerable elevation, with a descent at noon to normal or below. Long-standing cases with comparatively dry cavities and fibroid tendency often run a nearly normal temperature for a long period.

The temperature is affected adversely by an exacerbation of the disease, which frequently announces itself by a few days of gradually rising temperature. The thermic equilibrium is easily disturbed by the occurrence of complications such as a cold or pleurisy; intestinal indigestion is also frequently accompanied by fever. The first days of the menstrual period as well as the few days preceding it are not uncommonly attended with fever. The hidden cause of a considerable rise of temperature may prove to be an ischiorectal abscess, with pain and discomfort following well in the wake of the temperature elevation.

The temperature of the tuberculous is also readily influenced by both muscular and mental activity—piano-playing, letter-writing, worry, and all emotions tend to bring about irregular rises; and Huggard says that "persons suffering from tuberculosis with slight tendency to pyrexia usually show in their temperature charts the influence of a spell of warm weather occurring during the cold season. . . The same influence is frequently seen as the effect of exposure to the full blaze of the sun during the winter at Davos."[5]

Many attempts have been made to explain the presence of fever in tuberculosis and to account for its extreme variability; as yet, however, the subject is almost a sealed book.

Reasoning by analogy, it need not surprise us that tuberculosis—an infectious disease—should be characterized by fever; while the febrile reaction which follows the injection of tuberculin makes it probable that the temperature is affected by the absorption of the tubercle poison into the blood and lymph-channels. "The tubercle bacillus with the products of its metabolic activity is without doubt capable of giving rise to fever," says Cornet. This is, I think, universally conceded. But the matter is not as simple as it sounds. How are we to explain the extremely irregular and variable fever, the mild, subfebrile temperature, and the hopeless hectic?

In this connection I may say that the early fever is usually looked upon as being due to an uncomplicated tuberculous infection, and this seems a fair conjecture; while the high and irregular fever of advanced cases (in which there is considerable destruction of tissue) has been attributed to a secondary infection with the pyogenic cocci. This latter theory has held almost undisputed sway for several years; with modifications and additions it still obtains. Pettit[6] has shown that mixed infection is an important factor, and that the secondary infection is not simply a local one confined to the lung, but is a general bacteremia. He isolated streptococci and pneumococci from the blood in nearly one-half of 130 cases examined, and he found that this bacteremia was nearly twice as frequent in cases with a temperature over 100° F. as in cases in which the temperature did not reach 100° F. Lawrason Brown and Petroff[7] in a recent paper announce that they have discovered streptococci or pneumococci in the blood of 20 per cent of the incipient, 27 per cent of the moderately advanced, and 55 per cent of the far advanced cases. They also noted that patients with fever are much more likely to have positive blood-cultures than afebrile patients: and that those with definite ulceration of the lung are several times more likely to show positive results than those in whom no ulceration has been proved.

A dissenting voice to the secondary infection theory has been raised of late by Whitney,[8] who in examining the sputum of one hundred cases of tuberculosis found no evidence of secondary infection in ninety-six of these cases, although 21 were moderately advanced and 49 were far advanced. And Pottenger says: "I do not believe that associated bacteria are an important etiological factor in the production of all fevers which rise beyond moderate elevations in advanced tuberculosis, although they are unquestionably so in some."[9] In cases of advanced ulcerative tuberculosis he has sought the genesis of the fever, in part at least, in the presence of enzymes and autolysis of lung tissue. The scope of this paper does not permit of a fuller discussion of this subject, but it is apparent from what has been said that the fever-producing agents are both numerous and complex.

And in addition to these proximate causes of fever we are led by the extreme variety and the great excursions of the temperature in pulmonary tuberculosis to postulate some fundamental peculiarity in the thermotaxic mechanism, and accordingly there has been hypothecated a heat-regulating center of acute sensibility, comparable perhaps with the febrile irritability seen in hysteria and in the convalescence from acute diseases. In the normal human being, as well as in mammals and birds, the temperature is kept at a well-nigh constant level by "an intricate adjustment of physiological reflexes which together constitute the heat-regulating mechanism."[10] There is, however, a slight diurnal rhythm, the temperature being lowest early in the morning, rising to its maximum between 5 and 7 P.M., and falling again during the night. A slight rise occurs normally as the result of meals and muscular exercise, and the excess of heat thus produced, not being promptly dissipated, indicates that heat regulation even in so-called homoiothermous animals is not absolutely perfect. In tuberculosis these rises just referred to are accentuated, while still slighter causes such as psychic stimuli are enough to affect the hair-trigger, heat-regulating center of this disease with the production of a distinct rise of temperature. Tuberculous individuals frequently have an extremely irritable nervous system, and the behavior of the temperature depends to some extent on the idiosyncrasy of the patient, the impressionable heat-regulating apparatus and the multiplicity of stimuli both tending to make it variable. Such, in brief, are the theories of the fever origin in tuberculosis.

THERAPEUTIC CONSIDERATIONS.

Although the ultimate causes of fever are not entirely understood, its effects are very apparent. Aside from the fact that it demonstrates the presence of some pathological process demanding investigation, fever must be combated on its own account and all efforts made to reduce it by reason of its direct effects—loss of weight, impairment of appetite, and depression of spirits. As it happens, the treatment of the disease tuberculosis is in a large measure the treatment of its most important symptom, *fever;* for the temperature is our most valuable therapeutic guide, and no matter what procedure is employed, its action is to a great extent gauged by its effect on the temperature.

I shall make bold to specify some of the therapeutic relations of fever without attempting anything like an exhaustive discussion of the subject. The presence of fever usually is sufficient to warrant the institution of rest, which of all therapeutic measures comes first for permanently reducing the fever and the activity of the process on which it so largely depends. The degree and duration of rest to be insisted upon will depend on the height of the fever, the activity of the disease, and the recuperating power of the patient. In some cases a few weeks will suffice; in others, months are required to bring the temperature to normal. The degree of rest may be absolute or partial. With fever over 101° F. the former is indicated; this means that the patient must be put to bed in a well-ventilated room and must be spared all bodily and mental exertions as

far as is possible. With a temperature between 100° and 100.5° F. a compromise may be instituted by allowing the patient to recline on a cot outdoors, while with a fever not over 99.5° a reclining or steamer-chair of comfortable build may be used. These figures are not absolute and will vary with different cases and with different physicians; they are suggestive, however, of the relationship that exists between fever and treatment. With the reduction of fever and a persistently normal temperature for several days a moderate amount of exercise is allowed. Walking is the usual means of obtaining gradual exercise, and may be prescribed in five- or ten-minute periods once or twice daily, increasing the exercise gradually as the strength of the patient, the behavior of the temperature, and other symptoms allow. Exercise must be taken up very gradually and never persisted in to the point of fatigue, while its effect on the temperature must be carefully noted. If the effect be adverse, exercise must be given up or modified.

Sometimes it happens that despite strictly enforced rest in bed the fever continues, and is abated only when the patient is allowed somewhat greater freedom; thus, if the bed is exchanged for the reclining-chair, and very moderate exercise such as sitting up and moving about a little are permitted, there may result from these measures an improvement of nutrition, an increased resistance, with a gradual decline of the fever. In severe cases, with a fever of 103° or over, sponge-baths may be tried. Landis[11] advises beginning with water at 98° F., gradually reducing to 60° F. or under if no discomfort follows this procedure. While the effect on the fever is only temporary it often makes the patient more comfortable. The antipyretics once so much in vogue should not be used ordinarily; if prescribed they should be used only in cases in which the high fever has seriously impaired the appetite, and it should always be borne in mind that these drugs have but a temporary effect and that their continued use is dangerous. So much for the general management of the fever in tuberculosis.

At times, as already noted, fever may be significant of some complication such as a cold, a pleurisy, or an ischiorectal abscess, each of which demands appropriate treatment. At other times it may be due to some disordered state of the stomach or intestines, in which case calomel and salts will often promptly reduce a sudden, spirited rise which may have at first excited considerable apprehension. A rise of a more gradual nature is suggestive of progress of the lung lesion and calls for immediate and absolute rest. Irregular rises due to mental activity or emotional excitement are met with again and again; and all books or games that tend to excite the emotions or to stimulate a too intense mental activity must be prohibited. From what has been said it is evident that a temperature record is a valuable means of enabling the physician to keep watch and ward over his patient, advising him of the amount of exercise to be allowed and notifying him frequently of complications which might otherwise exist unsuspected.

Prognostic Import of Fever.—Fever is, moreover, of signal service in arriving at a prognostic estimate of any case of pulmonary tuberculosis; while not absolute nor exclusive, the course of the temperature is deservedly held in high repute as a means of predicting the ultimate outcome of the disease. It may be said, with certain reservations, that the height of the fever indicates the headway which the disease is making. The presence of even a slight temperature elevation is suggestive of a certain degree of activity of the process or of hypersensibility of the heat-regulating center; in such a case the disease cannot be considered cured. And in this connection I might say that the subnormal temperature so commonly found in the morning in tuberculous cases has an unqualified significance in the same direction, and until this disappears we must regard the patient as actively tuberculous. Also, a high temperature or an ascending temperature is cause for alarm and is expres-

sive of complications or of increased activity of the tuberculous process; while a slow, certain decline of the fever is among the most hopeful symptoms of the disease, keeping pace, as it does, with steady improvement of the local and of the general condition. While this is the rule it is not an infallible one, and all symptoms must be thoroughly taken into account before a prognosis is ventured upon. Bonney has recently commented on the lack of correspondence sometimes observed between the physical signs and the pulse and temperature. He says: "A number of patients classified as moderately advanced or far advanced have sometimes offered a relatively favorable prognosis upon the basis of but slight elevation of temperature, an excellent pulse, good appetite and digestion. Others presenting the physical signs of incipient involvement have exhibited occasionally high fever, acceleration of pulse, nervous disturbances, and important complications, in addition to temperamental peculiarities and other conditions inimical to favorable results."[12] In spite of exceptions of this nature the behavior of the temperature is a symptom on which we place the greatest reliance in predicting the course the disease will take. Thus a temperature continuing high throughout weeks and months, unaffected by rest and proper care, is prophetic of an advancing process and of an unfavorable termination. The type known as hectic, with several degrees between maximum and minimum, is usually a prefigurement of the approaching end. The occurrence of double or triple rises daily is also a sign of ill omen. Another such is a temperature which reaches its maximum well in the night, while the *typus inversus* prepares one for the impending dissolution.

On the other hand, a gradual subsidence of the fever, as has already been noted, goes hand in hand with improvement, and apyretic periods are associated with inactivity of the tuberculous process. A low temperature with few symptoms, yet rather extensive lesions, is not uncommonly met with in fibroid cases. A sudden depression of the temperature in advanced cases points toward pneumothorax or forecasts the fatal issue.

In conclusion, I would say that I have attempted in this paper an exposition of the salient features of the symptom fever in pulmonary tuberculosis, rather than a thoroughgoing or searching review of its origin and behavior, many phases of which are but imperfectly understood and still await explication. I would repeat that this symptom is not only of the greatest value in diagnosis, being outranked in this respect by tubercle bacilli in the sputum and hemoptysis alone, but that it is also of the utmost service in the treatment of tuberculosis, serving in the twofold capacity of guide and check; while in prognosis it occupies a position of extreme significance, at times approaching absolute reliability. And in calling attention to these facts I would emphasize the necessity of a thorough study of this symptom if we wish to obtain favorable results in the treatment of chronic pulmonary tuberculosis.

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BLOOD-SPITTING.

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Blood-spitting may be defined as expulsion of blood from the mouth, whatever the source of the blood. Necessarily it is simply a symptom, and, therefore, consideration of this symptom means differentiation of the causes which lead to it. The source of the blood may be any of the organs connected with the oral cavity, and, indeed, some remote from it, and it may be due to certain dyscrasias, such as scurvy, hemophilia, etc.

It will be my purpose to attempt to make such a differentiation. In the beginning of this paper I wish to call your attention to the important fact that hemoptysis and hematemesis are constantly mistaken for blood-spitting from other sources. This is a serious error, because of the seriousness of the conditions which usually give rise to the two latter conditions.

The causes may be arranged in the following manner:

First, epistaxis. Nothing is more common than nosebleed to give rise to spitting of blood; this even though the blood does not appear at the anterior nares. Therefore the first diagnostic act to be performed should be examination of the posterior pharynx, to be sure blood is not coming from the posterior pharynx itself, or flowing over it from the nose. The clots of blood attached to the posterior pharynx, due to large amounts of blood which are vomited or expectorated, must not be mistaken for hemorrhages coming from above. The blood which comes from the posterior nares, and also from the pharynx, which will next be discussed, can be seen to flow from above when the clot is wiped away. Hemorrhage from the pharynx or bleeding from the throat, to my mind, is a source of great error, or rather the thought that blood coming from the mouth is bleeding from the throat is a great error in the conception of the condition, for, as a matter of fact, while bleeding does occur from the pharynx, the blood being spat from the mouth, just as certainly the great majority of such cases is due to hemorrhage from the lungs. In consultation with a noted laryngologist I have been told that "it has been the rarest occasion for me to discover in the pharynx a bleeding point, either due to ruptured veins or an ulcer, which could not by careful examination be differentiated from expectoration of blood."

However, the pharynx is a source of blood-spitting, and should be so recognized, great care being taken, as I have said, that it is not mistaken for true expectoration of blood. The reasons for blood coming from the pharynx are dyscrasias, local conditions such as ulcers, and ruptured veins and bleeding adenoids. Careful examination of the pharynx should at once reveal the source of bleeding; the great trouble in diagnosis being that occasionally blood from the nose and pharynx is swallowed, or at least find a resting-place at or about the pharynx, and causes a cough. The blood is brought up with the mucus, and is frequently mistaken for expectoration from the lungs. This, of course, is a much less serious error than considering blood from the lungs as coming from the throat. Sennon and Williams say that "hemorrhage from the pharynx is deserving of special note, not so much on account of the actual cause of bleeding in this region, but of the frequency with which patients complain of bleeding from the throat, and of the gravity of the pulmonary hemorrhage, which is only too often the real source of the loss of blood attributed to the larynx;" and the author might add that physicians are all too prone to allow the patient to believe that the bleeding comes from the throat in these instances. A rather rare source of bleeding from the pharynx is due to traumatism, from some hard body swallowed.

Bleeding from the tongue itself may occur from a traumatism, such as biting

the tongue in a convulsion, or in a fall, or from some ulcer of the tongue.

Bleeding from the gums is extremely common. Of course as a symptom of scurvy it is the commonest of occurrences. Then the gums become tender and inflamed, due to neglect of the teeth, and a consequent pyorrhea. The slightest touch of the gums under these circumstances will often cause bleeding, and is a fertile source of expectoration of blood. This can easily be discovered by careful examination of the gums with a mirror.

Bleeding from the larynx may occur as the result of any ulcer of the larynx, and occasionally from traumatism. The ulcers most commonly causing laryngeal hemorrhages are carcinomatous, tuberculous, and syphilitic. Usually accompanying such a laryngeal hemorrhage is hoarseness of the voice. Examination of the larynx by means of a mirror will almost without exception show the true source of the hemorrhage. Laryngeal hemorrhage may give rise to true expectoration of blood.

Hemoptysis, hemorrhage from the lungs, is the most common and fertile source of expectoration of blood. It should never be forgotten that an individual who applies for the symptom of blood-spitting should be put through a most rigid course of history-taking and physical examination before hemorrhage from the lungs is excluded. Frequently, slight pulmonary hemorrhage is a danger-signal which will save the patient's life, if it is properly interpreted. Small hemorrhages from the lungs, which are so common in the early stages of tuberculosis, have as a symptom, first a simple tickling in the throat, a slight hacking cough, and the expectoration of blood. This may amount to only a mouthful or two of blood mixed with sputum, or it may be a very serious hemorrhage even in the beginning. Almost always it is accompanied by cough; almost always the blood is either mixed with mucus or else it may be frothy. Vomiting with such hemorrhages is rare, unless the hemorrhage be extremely large and the act of vomiting be caused by the mass of blood expectorated. Usually examination of the lungs will discover a spot of consolidation, but the exact source of the hemorrhage is not then always easy to tell; particularly is this the fact in advanced tuberculosis of the lungs, where hemorrhage may come from almost any area, and give rise to no specific signs as to its immediate source.

Expectoration of blood may also occur from pressure of mediastinal growths, either an aneurism or a solid growth, and, indeed, a rupture of the aneurism may be preceded for a number of days by extrusion of blood into the bronchus or trachea.

A common source of expectoration of blood is heart disease. So severe is the pulmonary hemorrhage occasionally from such a source that the case is frequently mistaken for one of tuberculosis, and the heart lesion overlooked. Perhaps the commonest heart lesion with which the expectoration of blood is associated is mitral stenosis. In this condition the expectoration of blood may be massive, resembling in almost every particular a large hemorrhage due to tuberculosis of the lung. Most commonly, however, the expectoration is very slight and lasts over a long time. Occasionally, again, the attack comes on very suddenly; there is edema of the lungs, and the blood is not massive but is in the form of a bloody froth, not a frothy blood, accompanied with a great amount of dyspnea and cardiac dilatation. Many instances of this condition I am sure have occurred to all of us. The most important fact is that we should realize that heart disease can give rise to severe hemorrhages of the lungs, so that we may not simply, from the symptom of hemorrhage, make a diagnosis of tuberculosis.

Arteriosclerosis is an extremely common source of hemorrhage from the lungs, particularly when the heart is dilated as the result of a long-standing pressure; under such conditions the bleeding is rather constant and in small quantities.

True pulmonary apoplexy or pulmonary infarct due to embolism from the auricle is a common source of bleeding, and is con-

stantly mistaken for bleeding due to tuberculosis. Here examination of the heart, and a sudden onset of localized pain, dulness with signs of consolidation, are indicative of a pulmonary embolism. The coexistence of tuberculosis and heart disease is now known to occur. It used to be thought that heart disease precluded the possibility of tuberculosis. Among the cases published by Ullom, he examined 400 of bleeding, all of which were thought to have tuberculosis. Sixteen of these cases were pure cardiac condition, mostly mitral disease, and not due to tuberculosis at all.

The diagnosis must be made purely from the history of the case; from the physical examination; from the examination of the sputum. You must remember, however, that tuberculosis may exist with heart disease, and therefore the mere finding of tubercle bacilli in the sputum is not evidence that the bleeding itself does not come from the heart.

The next source of bleeding is the esophagus, the stomach, and the duodenum. Of course blood coming from either of these organs is vomited, not coughed, and yet, nevertheless, the diagnosis is not always easy. The blood usually is bright-red, although not necessarily; it is clotted and is mixed with particles of food. Hemorrhage from the esophagus may be traumatic; it may result from an acute inflammation or an ulceration, or from the rupture of veins at the lower end, due to cirrhosis of the liver.

The blood which comes from ruptured varices at the lower end of the esophagus is vomited; usually it is clotted and in large amounts. It is constantly confused with vomiting of blood due to gastric or duodenal hemorrhage.

The diagnosis must be made from the previous history of the case. As a rule in gastric ulcer there is a previous history of ulcer, which is not present in varices of the esophagus.

On the other hand, the hemorrhages which occur from esophageal varices frequently give absolutely no history. There may be a history of long-standing indigestion, which is a symptom of the oncoming or present cirrhosis of the liver. There may be blood in the stool following the vomiting; the blood is the result of this hemorrhage just exactly as it is when it follows the blood from a gastric or duodenal ulcer.

Hemorrhage from gastric ulcer or duodenal ulcer may be great or small. The blood vomited is usually bright-red and frequently appears in the stool some time shortly after the vomiting of blood. Of course when it appears in the stool, the stool is of a tarry nature rather than characterized by bright-red blood. Here there is a history of gastric ulcer, and when the history is exact it cannot be mistaken. For instance, the history of indigestion, with attacks coming on particularly in the spring and fall, with perhaps very long intervals between attacks; the attacks being characterized by pain two or three hours after eating, and in the middle of the night sharp, severe pain, which can almost immediately be relieved by eating. There are other gastric ulcers whose history is not so typical, and which confuse the best informed.

Hemorrhage from carcinoma is usually dark, usually not so great in quantity as the amount from ulcer, and has the typical "coffee-ground" appearance. In both ulcer and carcinoma of the stomach, occult blood in the stool before a severe hemorrhage occurs is frequently present. It must be remembered always that when stools are examined for occult blood, whether the result is negative or positive, a *single* examination is practically of no value. Diagnosis of carcinoma of the stomach must depend largely upon the history, the pain, the gastric content findings, and upon the general character of the patient's condition.

The various dyscrasias—scurvy, purpura (hemorrhagic), hemophilia, and long-standing jaundice—may be accompanied by hemorrhage from any one of the organs affected, and may give rise to the spitting of blood. Here the diagnosis must depend upon the recognition of the fact that local hemorrhages can arise from such condi-

tions. This being once realized, one is in the position to at least think of these constitutional diseases when there is a local bleeding; and having thought of it, the diagnosis can very easily be substantiated or refuted by consideration of all of the questions in the case.

HEMATEMESIS.

1. "Previous history points to gastric, hepatic, or splenic disease.

2. "The blood is brought up by vomiting, prior to which the patient may experience a feeling of giddiness or faintness.

3. "The blood is usually clotted, mixed with particles of food, and has an acid reaction. It may be dark, grumous, and fluid.

4. "Subsequent to the attack the patient passes tarry stools, and signs of disease of the abdominal viscera may be detected." (Quoted from the "Principles and Practice of Medicine," Osler.)

TREATMENT OF BLOOD-SPITTING.

Blood-spitting being a symptom, the treatment, of course, must depend upon the result of diagnosis, as I have tried to outline.

Epistaxis.—If the epistaxis is traumatic, necessarily a careful examination of the parts must be made, and any deformity corrected; if necessary the parts must be packed. If the case of epistaxis, however, is one of the dyscrasias, particularly of arteriosclerosis, then the general treatment of the case is the immediate one. If it occurs from unknown causes, then the simple treatment of bleeding itself is all that is necessary. I know of few things which are treated worse by the laity, and by some physicians, than nosebleed. The nose, of course, should be carefully examined, and if any foreign bodies such as polypi are present, they should be removed. The patient should be quiet, lying down, with the head slightly raised, and simple pressure made upon the anterior nares. Usually the bleeding will stop with these simple measures. If it persists, however, then the nasal cavity should be thoroughly cleansed and a solution of 1-to-1000 adrenalin applied to the bleeding point, if that can be discovered; if that point cannot be made out, then spraying of the cleaned nasal cavity will be of value. The worst cases have to be plugged. Usually the plugging from the anterior nares is all that is necessary—a narrow strip of gauze being carefully carried back to the posterior nares, and then the whole cavity packed with gauze.

Bleeding from the pharynx lends itself usually to local treatment, provided of course there is no dyscrasia, as does also bleeding from the mouth.

Bleeding from the gums when not due to some general condition is usually the result of lack of attention to cleanliness. The patients frequently have pyorrhea. This, of course, must be remedied first, before any thought of recovery of the gums can be expected. Careful cleaning around the root of each tooth and the use of peroxide of hydrogen, or chlorate of potash and boric acid, is usually all that is necessary.

Once the diagnosis of hemorrhage from the lungs is made, immediate treatment is necessary. In beginning cases few are fatal or even very serious—indeed, it often seems to me it is a favorable thing to have a hemorrhage, because it attracts our attention in a very insistent way to a condition of the lungs which we may have otherwise missed.

The simple hemorrhage needs simple rest as treatment, control of the cough, and restraint from talking. The patient's mental condition should be quieted, because almost without exception under these conditions the patient is much excited. If the excitement is great, a simple hypodermic of morphine is all that is necessary. The use of nitroglycerin is of value in that it lowers the general blood-pressure if given in large enough doses and during short intervals—1/50 or 1/100 of a grain every hour, depending upon the physiological effect, and continuing until the bleeding ceases. Ice to the chest, if the point of bleeding can be discovered, is of value.

Larger hemorrhages need continual rest

in bed with application of exactly the same remedies. Nothing is of value in the tremendously severe hemorrhages which cause almost instant death. Internal remedies are notoriously of little use. Adrenalin would be out of place, because so far as is known the action of adrenalin is to relax the spasms in the bronchial muscles; it does not contract the vessels, so far as the best teaching goes. Ergot, which was formerly so universally used, is now not administered at all by those who believe it has no effect upon the bronchial vessels and does raise general blood-pressure.

Alcohol should not be used.

Tannic acid and gallic acid have no value at all.

In the long-continued hemorrhages, those which last for days, in which the bleeding is very persistent, and in which there seems to be a dyscrasia, perhaps of the purpura state, the injection of human serum should certainly be tried, and indeed horse serum may also be used. Calcium lactate can be used in these cases to stop this sort of bleeding. Finally, in repeated pulmonary hemorrhage, which nothing seems to do good, the lately advised use of artificial pneumothorax by forcing nitrogen into the chest may be tried, and certainly appears to do some good.

There is not much to be done for cases that vomit blood due to esophageal varices. The bleeding usually comes from the rupture of a rather large vein. Here the administration of adrenalin by the mouth may be tried, if there is oozing instead of a large rupture, when it may do some good. Nothing else should be taken by the mouth, except water.

In hemorrhage from gastric ulcer, the patient must be kept absolutely still in bed on a starvation diet, and morphine administered hypodermically. Adrenalin may be given, and large doses of bismuth, until the patient is in fit condition to be operated upon.

It must always be remembered that certain bleeding from the stomach is not due to an ulcerated surface, but rather to an oozing, and these conditions are very well treated by large doses of adrenalin by the mouth, and by the use of normal serum.

In severe cases the extremities should be bandaged and an ice pack placed on the epigastrium.

THE TREATMENT OF CHRONIC SCIATICA.[1]

BY MORRIS J. LEWIS, M.D.,
Physician to the Pennsylvania Hospital and the Orthopedic Hospital and Infirmary for Nervous Diseases;
AND
WILLIAM J. TAYLOR, M.D.,
Surgeon to the St. Agnes Hospital and the Orthopedic Hospital, Philadelphia.

REPORT BY DR. LEWIS.

The success following the surgical treatment of two cases of inveterate sciatica which Dr. William J. Taylor and myself have had under our care at the Philadelphia Orthopedic Hospital and Infirmary for Nervous Diseases has been so pronounced that we deemed the subject of sufficient importance to bring before the College.

While there is nothing new in the treatment followed, it has not received the attention that its merits deserve, and with the purpose of calling attention anew to the procedure this communication is made.

[1]A paper read before the College of Physicians of Philadelphia, April, 1913.

The term sciatica is commonly applied to all affections where pain in this nerve is the main symptom, but for the purpose of this paper a more exact diagnosis must be made.

J. Crawford Renton in the *Scottish Medical and Surgical Journal,* Edinburgh (vol. i, page 35, 1897), reports four cases in which he operated by stretching the nerve and freeing adhesions, and considers the benefit consequent upon this operation was due to the removing of the adhesions and not to the stretching of the nerve. The same writer in the Proceedings of the Royal Society of Medicine (vol. i, 1907-1908, Surgical Section, May 12, 1908) re-

ports operating on 32 selected cases of sciatica by removing adhesions, with most satisfactory results, and divides sciatica into four classes:

1. Neuralgia of the nerve.
2. Neuritis.
3. Perineuritis.
4. A combination of neuritis and perineuritis.

He considers that it is all-important that a correct diagnosis be made as to which of these four divisions the case in question belongs, for it is only in those chronic cases in which adhesions due to a perineuritis, with or without neuritis, exist, that good will follow the operation, which consists of merely exposing the nerve and freeing it from all surrounding adhesions, the dragging on the nerve by these bands causing the pain. This operation is not indicated in any acute case of neuritis, for here the ordinary treatment for sciatica should be employed. Those cases due to spinal or pelvic or bone lesions, or those in which it is believed that a pure neuralgia or neuritis exists, evidently should not be considered here.

Nerve stretching, at one time advised, has been found to do good in but a few cases, whether it is performed by the open method of exposing the nerve and forcibly stretching it or by merely extending the leg upon the thigh. Where good has followed these procedures it has in all probability been due to the stretching and tearing of the adhesions which have been the real cause of the trouble, and not to the stretching of the nerve itself.

Holmes, in Osler's Modern Medicine, vol. vii, speaks of the injection of saline solution "into the sheath of the nerve," and many writers speak as if the nerve had a distinct sheath enclosing it, but the two cases here reported had no such sheath, as the nerve lay between the muscles with but a slight filamentous covering. Injection of alcohol, advised by some, is not without its dangers, as this might cause a necrosis with serious after-effects.

Among the various treatments of ordinary sciatica due to a neuritis may be mentioned rest in bed, salicylates, iodides, splinting of the leg, local heat or even cold, iron and arsenic, electricity in various forms, acupuncture, or actual cautery, but after these methods have been faithfully tried in combinations thought best to meet the indications of the case, and where the symptoms of neuritis have subsided and those of perineuritis or adhesions have taken its place, it is incumbent upon us to operate.

In cases of perineuritis the patient is usually able to lie in bed or to stand, without pain; there may be pain on pressure, but this is not as acute as where there is neuritis. The primary neuritis and the subsequent disease of the leg may cause atrophy of the muscles, as seen in both of our cases. Cases of perineuritis may even be able to take a few steps without distress, but very soon such use of the leg brings on paroxysms of pain. Sitting, both on account of the pressure on the nerve and of the angular position of the leg, is more distressing than either standing or lying down, but naturally not so much so as where a neuritis exists.

The cases upon which this report is based are as follows:

Case 1.—J. McG., aged fifty, chauffeur. Family history negative. No history of rheumatism or of injury, unless frequent blows by the ball on the left thigh when playing cricket as a young man could be called so. Soon after coming to America in 1888 he noticed that he had occasional pain in left sciatic distribution. A severe attack followed this, lasting over one month, in which there was evidently a neuritis. Following this he had at varying intervals four more severe attacks, the last one coming on gradually in the spring of 1912, and was evidently mainly a perineuritis as he was comfortable when lying down or standing, and even comparatively so when manipulating the clutch of the automobile with his left leg, but when sitting still after the day's work he had much pain. Walking for a few minutes brought on much pain, which was practically absent

on starting to walk. Running the automobile soon became impossible.

He was admitted into the Orthopedic Hospital and Infirmary and was operated on in July, 1912. In his various attacks he had been more or less under my observation, and most of the ordinary methods of treatment were tried. Blistering and iodides during the neuritis stage gave him the most relief, but later these failed, evidently as he was mainly suffering from a perineuritis.

Dr. Taylor was asked to expose the nerve and to free it of all adhesions that might be present. Three weeks after the operation the patient was able to walk home without pain, and after recuperating for a month was able to resume his occupation as chauffeur, which he has kept up constantly since then, running the automobile daily and sometimes all day, with no discomfort whatever, up to the present time (April, 1913). The atrophy which had affected the leg is, however, not yet entirely recovered from.

CASE 2.—W. H., aged thirty-five, machinist. Admitted into hospital in November, 1912. Family history negative. Six years before coming under observation he had been operated on for gall-stones following typhoid fever.

One year before coming under observation he had had a severe attack of phlebitis in his right leg, and since then has had pain steadily in the course of his right sciatic. He has been habitually constipated. His occupation as machinist subjected him to heavy work and great strain and to great variations of temperature, but he had been unable to do any work whatever for one year on account of pain. He never used alcohol nor tobacco and denied venereal diseases.

On admission into the Orthopedic Hospital and Infirmary he was found to have great tenderness along the entire course of the right great sciatic, but there was no evidence of venous thrombosis or varicosities. There was considerable wasting of the right thigh and calf. He was placed on absolute rest, warmth to leg, and iodide of sodium.

The patient became comparatively comfortable when at rest or standing, but use of the leg brought on great pain. After a considerable period of time, as he made no further improvement it was considered that he mainly suffered from a perineuritis, and it was decided to operate in the same manner as in Case 1 in January, 1913. He made a rapid recovery and was able to leave the hospital in three weeks, suffering no pain. At the present time (April, 1913) he is free from pain except on deep pressure over the upper one-third of the scar. He can move his leg freely and walk without discomfort, and intends soon taking up his work again.

It is very strange that this operation with its very high percentage of success should have apparently fallen into oblivion after it had been once brought before the attention of the profession, and it is hoped that this report may awaken interest in this easily performed, highly successful and practically harmless operation, which could be safely repeated should adhesions reappear.

Dr. Taylor will describe the operation and the findings at the time.

REPORT BY DR. TAYLOR.

The treatment of chronic sciatica by operation is not new, but it certainly has not received the general recognition which its great merit deserves.

It should be undertaken only in cases of perineuritis or in those cases in which there is a combination of neuritis and perineuritis.

Sciatica is regarded by Sir William Gowers and Dr. Frederick Taylor as a true neuritis in the majority of cases, as is shown by anesthesia and muscular atrophy. Neuritis may be: first, interstitial, affecting the connective tissue; secondly, parenchymatous, affecting first the nerve fibers themselves; and thirdly, a combination of the two.

When the neuritis affects chiefly the perineurium or sheath, the nerve fibers may escape serious damage. If it affects the endoneurium, then the nerve fibers are more likely to be affected. A new fibrous

tissue may develop in the interstitial tissue and sheath, and around this a varying amount of pathological exudate or adhesions take place. In the parenchymatous form the disease begins in the nerve fibers and may lead to serious results.

Dr. Renton has operated upon thirty-two cases, and all have been benefited, not only at the time of operation, but have remained well, some for a period of thirteen years.

Our first case was operated upon July 15, 1912, and the great sciatic nerve exposed by an incision extending from the gluteal fold to the lower third of the thigh. An anomalous nerve was found, a very high bifurcation—in fact, two nerves instead of one. Both were congested and somewhat swollen, with firm adhesions binding them to the surrounding tissues, and with very dense adhesions between the two branches binding them together very firmly.

These adhesions were dissected off with great care, and the nerve freed for the full length of the incision. The condition was one of a perineuritis occurring in a nerve of anomalous development. This was undoubtedly a great factor in the production of the pain.

Our second case was operated upon January 24, 1913. An incision was made from the gluteal fold some eight inches downward, and the great sciatic nerve exposed.

This nerve was found to be much redder than normal, and there was an anomalous branch coming off from the center of the nerve, extending downward for two inches, where it branched into two parts, thus giving the appearance of an inverted Y, the two branches riding astride of the main nerve. There was also an anomalous branch from the outer side of the nerve, extending downward. Beneath the first branch, and particularly where it bifurcated and overrode the main nerve, there were many adhesions, with evidences of much former acute inflammation, binding this branch down upon the main nerve. These adhesions, which were very dense, were dissected away with great care.

From the moment the patient recovered from the effects of the anesthetic his relief from pain was complete, and from the time of operation until now (April, 1913) he has had no pain whatever. The sudden and complete relief from very severe pain, which had been continuous for fourteen months, pain which for twelve months had totally incapacitated him, cannot have been a coincidence, and must have been the direct result of freeing the anomalous branch of the nerve from its inflammatory adhesions.

In these two instances the nerve showed distinct departure from the normal, and it is a matter of great interest and importance to determine if there is often an anomalous condition of the great sciatic nerve in these cases of chronic perineuritic pain. Certainly in these two cases the anomalies of the nerve predisposed toward adhesions, in one instance binding together the two branches in the high bifurcation, and in the second binding the sheath of the main nerve and the overriding branch, thus preventing complete recovery from what might otherwise have been an ordinary attack of sciatica.

Dr. John C. Heisler, who has very kindly taken the trouble to look up the question of anomalies of the great sciatic nerve, states that consultation of Morris, Cunningham, Tolde, Sobotta, and Quain fails to reveal any anomalies of the great sciatic nerve other than the variations mentioned in the current text-books. He has never met with any other anomalies than these. The McMurrich edition of Morris states that the internal and external popliteal nerves are separate from each other all the way up to their origin from the plexus in ten per cent of cases, and that in such cases the external popliteal nerve usually pierces the pyriformis; this coincides with Dr. Heisler's own experience. The nerve for the hamstring muscles may also be entirely separate up to the place of origin from the plexus. Quain mentions this particularly, and quotes Henle to the effect that the division of the sciatic into the internal and external popliteal nerves may take place below the popliteal space. He has found the two

popliteals to emerge separately from the pelvis, a smaller trunk, evidently the external popliteal, piercing the lower part of the pyriformis, and uniting into a single trunk at or slightly below the lower border of the gluteus maximus, separating again near the middle of the thigh.

Nerve stretching would have done no real good to either of these patients, and no attempt at stretching was made, simply dissecting off carefully all of the adhesions. Nerve stretching has not proved of permanent benefit in many of the cases in which it has been practiced, and of late years it has seldom been employed. In one of Renton's cases (Proceedings of the Royal Society of Medicine, vol. i, 1908, Surgical Section, page 167) the sciatic nerve was stretched, but the pain returned, and on again exposing the nerve an adhesion was found extending up to the sciatic notch. When this was removed, as well as other adhesions about the external and internal popliteal nerves, the patient remained free from pain for many years.

When a case of sciatica has not been relieved by proper medical treatment, and especially when the patient is free from pain while resting in bed, and when pain is brought on again by the movements of the thigh, the nerve should be exposed by an incision and examined for adhesions. Small adhesions may disappear, but large and numerous adhesions will not. In all cases of perineuritis with many and large adhesions there must always be a certain amount of neuritis due to dragging upon the nerve by adhesions, but this subsides after operation. Nerve stretching can only prove of value by breaking up adhesions, and as can readily be understood it is only in very small and slight adhesions that any benefit can be expected. In large and numerous adhesions nothing short of a careful dissection with a knife can offer any possible relief.

This operation is one of little danger, does not expose the patient to serious risks, and offers great chance of permanent relief.

SOME RESULTS OF A COMPARATIVE STUDY OF SEVERAL METHODS FOR THE OPERATIVE TREATMENT OF FRACTURES.

BY J. E. SWEET, M.D., AND HENRY WINSOR, M.D., PHILADELPHIA, PA.

[From the Laboratory of Surgical Research, University of Pennsylvania.]

It sometimes seems advisable in a research laboratory to experimentally collect and compare the results obtained in a given operation by the use of different methods. The personal factor enters so largely into technical procedures that it becomes impossible to compare the results obtained by one operator using one method with the results obtained by another using a different method. The experimental method offers one other great advantage, the value of which may not at first occur to one; successful clinical results are only rarely to be examined by post-mortem study, while experimentally the successes and failures can be compared—we can learn perhaps not only why we fail, but what is more important, why we succeed.

It was with this general idea that we have undertaken to carry out the suggestion given us by Dr. Edward Martin to work over comparatively some of the different methods which have been used in the operative treatment of fractures of the long bones. We have thus far used four methods, two intramedullary and two extramedullary devices; bone dowels, or pins, and such of silver tubing; Lane plates, both of steel and of steel silver-plated; and a steel plate fastened with a special bolt and nut.

Our work is not yet finished, but several points have developed which seem worth noting. It is hardly worth comment that an infection vitiates the results of any method. Work upon the bones of the dog is decidedly more difficult than similar work under clinical conditions; the bone-

marrow possesses a more abundant blood supply, so that the blood will often fairly spurt from a drill hole. All the tissues are more delicate—traumatism is relatively easy. The result is that one meets with difficulties due to the postoperative formation of large hematomata, caused by uncontrollable oozing, with the increased troubles of wound healing and the development of ideal conditions for bacterial growth. By strict attention to the rules which have been laid down by the clinicians for the open treatment of fractures, fair results as regards percentage success can be obtained.

FIG. 1.

Another difficulty, the importance of which will be considered later, is that no device will probably secure a satisfactory postoperative fixation; the dog will at least move his muscles constantly in an effort to use the limb, even though he be prevented from actually walking on it.

The first question which we think we have settled to our own satisfaction relates to the periosteum. The periosteum in the dog is an extremely delicate membrane, which strips from the bone easily, even apparently adhering more readily to the surrounding tissues than to the bone, and, like other tissues of this type, as the dura mater, contracting so hopelessly as to prevent its being returned by suture to its normal site. The result of this stripping of the periosteum and its effect upon fracture healing is seen in Fig. 1. Specimen 13 shows most clearly what may happen. The specimen shows the oblique line of the operative fracture, and below this a separation of the bone. This separation was produced intentionally, post mortem, to demonstrate in the photograph the distinct line of demarcation which is clearly to be seen in the original between the newly proliferated bone underneath the retracted periosteum and the shaft from which the periosteum had been stripped. New bone was being formed only from the periosteum, and this new bone formation was even taking place in the form of a splinter, extending laterally into the tissues from the shaft. Specimen No. 12 shows a similar condition. In both of these cases infection was present, which may have made the result more pronounced. In Specimen No. 3, with no infection, the result, though not so pro-

nounced, is the same, general hypertrophy of bone except at the site of fracture—*i.e.*, where most needed. Specimen No. 21, a specimen obtained after 113 days, shows again the line of fracture, which was filled with cartilaginous tissue. This case was a clinical success, but theoretically doubtful.

These specimens have been chosen because they best illustrate our point; the same result is seen in all our post-mortem findings. In the dog new bone is only formed from the periosteum, and therefore not at the point where it is most needed, over the line of fracture. In the human being callus formation takes place from both the periosteum and the endosteum. The preservation of the periosteum would therefore not be so important as in the dog, yet we would nevertheless offer the suggestion that the periosteum be carefully treated, and if possible sewed together over the line of fracture. We are at present studying a series in which a plastic flap of periosteum is sewed over the line of fracture.

The next point of general interest is the question of the effect of mobility between the fragments. It has been thought that slight mobility might be of advantage, by stimulating the production of bone between the fragments. Specimens No. 2 and No. 10, Fig. 2, show why we have reached the conclusion that mobility is harmful—*e.g.*, because it results in a wearing away of the bone of the one or other fragment. These specimens were obtained from two animals in which the bone fragments had been joined with bone dowels, or pins. In specimen No. 2 the peg was not fastened, but was driven in tightly; the peg was removed, before taking the photograph, in order to show the size of the normal medullary cavity, while in the fragment above is seen the cavity which was hollowed out by the continued motion of the bone peg, fast in the lower fragment. In specimen No. 10 the bone peg, still in place, was fastened by screws; the movements of the dog caused a portion of the upper fragment to break away, and a cavity was again hollowed out, so considerable, in fact, as to produce a false joint. That such a bone dowel can remain tight is seen in this same specimen, where the peg is perfectly firm in the lower fragment. In specimen No. 1 the peg itself broke in two, but the two parts of the peg have both become integral parts of the bone. Specimen No. 5 shows a radius with the ulna acting as a splint—in other words, in which

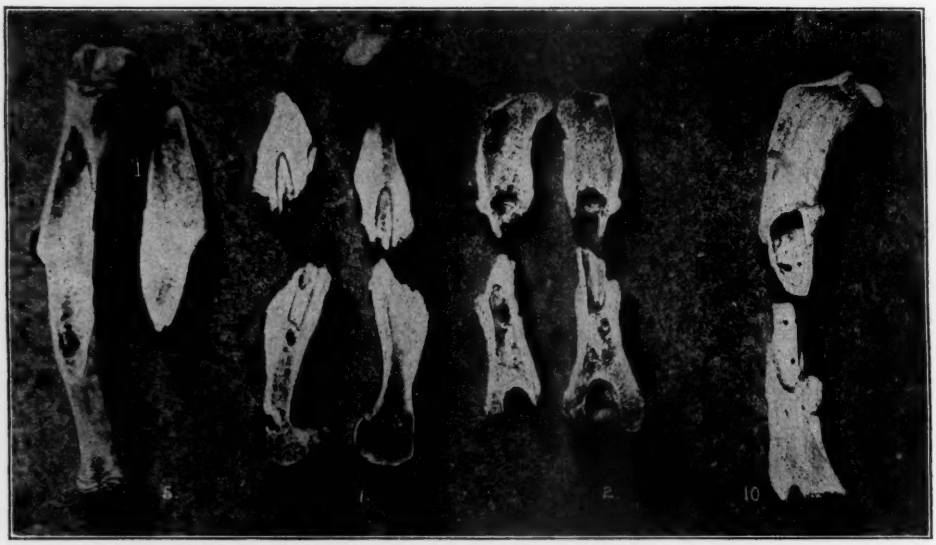


FIG. 2.

motion was successfully limited there has been a perfect union, with complete disappearance of the bone peg.

It might be said that the point is not proven by this method because the bone dowels do not fix the fragments sufficiently firmly. In order to test further this question of mobility, we have therefore devised a bolt and nut for the purpose of mechanically fastening the fragments in an immovable position (see Fig. 3). The bolt is provided with a shank of sufficient length to pass through the cortex, and the nut is provided likewise with a shank long enough to extend through the plate and cortex on the opposite side of the bone from the head of the bolt. The holes are drilled with a drill of a proper size to permit of a driving fit. The ends of the fragments are drilled, lifted out of the wound, and the bolts, made with this object of considerable length, are driven into the holes from below. One end of the plate is made fast by screwing the nuts down with a split screwdriver. The bolts are then cut off flush with the tops of the nuts. The projecting ends of the bolts which were inserted in the holes in the other fragment are then inserted in the corresponding holes in the plate, and the fragments are brought into place by screwing the nuts down upon these bolts. An immense pressure can be exerted, as is seen in specimen No. 27, Fig. 3, where the widening of the lower fragment which appears in the photograph was caused by a squeezing of the bone to the extent of producing a flattening, with fissure fracture at each side. Yet even such a device fails of its object, in the absence of satisfactory external splints, as is seen in Fig. 4. In specimen No. 18 it failed because the constant motion finally caused the nut at one end, the lower fragment, to work loose, with the result shown. This could be prevented by making the bolts of soft steel and riveting them in place, but while this would prevent the accident illustrated, it would probably not accomplish the desired object. Specimen No. 20 will illustrate the point. This animal, with the plate bolted in position on a fractured femur, was using the leg on the day after

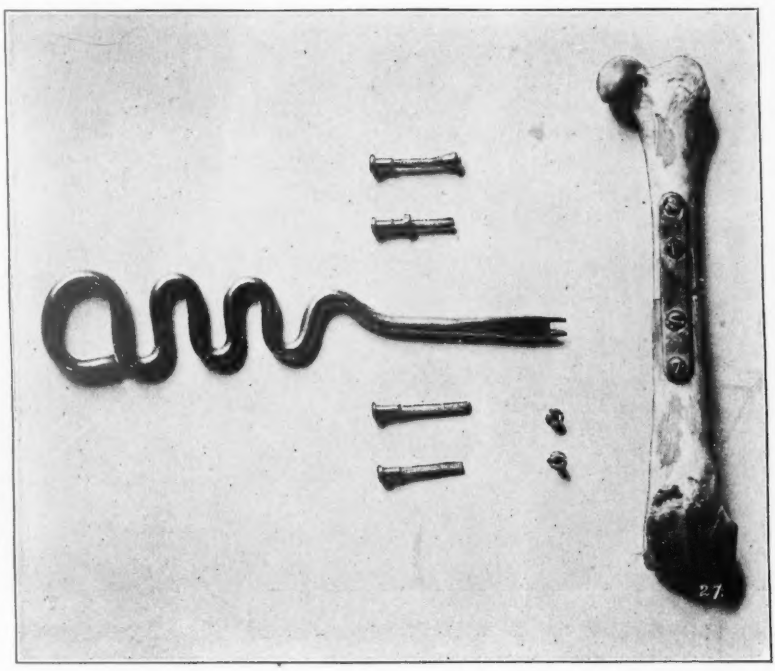


FIG. 3.

the operation, and continued to walk on it, without splints, until about the seventh day. He then ceased using the limb; mobility and crepitus developed, and the dog was chloroformed on the ninth day, to ascertain the cause of the failure. It was found that the constant motion had so enlarged the drill holes in the lower fragment that considerable mobility was possible. The plate was still firmly bolted to the upper fragment.

FIG. 4.

Our second general conclusion is, therefore, that no matter what the method of fixation of the fragments, there must be a complete postoperative fixation of the limb; we incline to the opinion that any mobility, no matter how slight, is disadvantageous. In connection with this question, we are convinced that a constant stress, such as might be exerted upon a screw by a constant muscle pull, or by the weight of a limb, will result in a pressure necrosis of the bone around the screw. Our experiments along this line have not yet been successful in demonstrating the point, because of the failure of the devices used to exert a constant pull on the screw; it is not entirely simple to design a device for exerting a constant force comparable to that which must be exerted upon the screws of a Lane plate by the muscle pull and torsion and by the weight of the limb. In other words, we must always remember that we are dealing with living bone, not dead bone or wood, and that the living bone tissue is subject to the same laws of pressure necrosis as any other living tissue.

If it would not seem too presumptive upon the part of experimental workers, we would like to suggest that every plated fracture should be treated, after plating, exactly as though it had not been operated upon. If extension is indicated, or extension in two directions, or the double inclined plane, or the position of extreme flexion, etc., let whatever method would give the best results in the case in question without operation be carefully and rigidly

followed after plating; relieve the plate and screws of all strain, if possible, and at any rate of some strain.

We are not prepared to express now a definite opinion in the matter of which procedure has given the best results in our work. We have had good clinical results with all the methods. We do not favor the use of silver, even as a plating for a Lane plate; it seems, in the dog, to excite a great overgrowth of callus, as in specimens MS and No. 17, Fig. 4, and that not necessarily at the desired point. There is also an infiltration of the bone and the surrounding tissues with silver salts to the extent, it seems, of actual harm to the tissues. Steel has some action upon the tissues, seen in the softening and discoloration of the tissues immediately in contact with the plate and bolt heads. Certain considerations undoubtedly favor the bone dowel. A dowel pin is the logical mechanical device for repairing and strengthening a structure such as the long bones; if it remains tight, it does not constitute a true foreign body, and it will be completely absorbed. At the same time it is difficult to apply such a pin and have it really tight in both fragments, and if it is not tight it will become a foreign body in the medullary canal and make more trouble than any other device. The same would be true if infection should occur.

TREATMENT OF ECZEMA.

ADAMSON in the *Clinical Journal* for February 26, 1913, says the treatment of eczema may be summed up in three words: protection from irritation. Although we know that in persons who suffer from eczema there is some predisposing factor which renders the skin highly susceptible to local irritations, and we also know that a change of diet, a change of climate, or other alteration in the conditions of life may sometimes lead to the spontaneous disappearance of eczema, yet in the large majority of cases we fail to find anything which points to an internal cause, and treatment in the form of dieting is altogether ineffectual.

In a few cases, which we may perhaps, in deference to the patient's own views, call "gouty cases," it is an advantage to restrict the meat diet and alcohol. In many cases, however, we find that the patient has been starving by treating himself on anti-gout lines, and needs feeding up.

Occasionally one meets with cases in children where eczema is said to alternate with asthma, but although Adamson has several times met with this association, he does not regard it as a common one. In most cases, he repeats, we find no definite predisposing cause, and we do far better to concentrate our attention upon the removal or prevention of local causes.

Apart from the local irritation of various trades or occupations, eczema may be kept up by strong soaps, the intermittent use of water in the ordinary daily ablutions, friction of rough clothing, the irritation of dust from books and papers, and above all by the rubbing and scratching of the patient. It is generally this last which is responsible for the continuance of the eczema, and it is a most difficult factor to eliminate.

In acute eczema, it is advisable, if possible, to keep the patient in bed, at any rate until the acute stage has subsided. One of the best and simplest applications for such cases is a continuous dressing of butter-muslin folded four or five times, and soaked in normal saline solution (common salt one drachm to one pint of boiling water). If there is difficulty in keeping the dressings moist they must be covered with gutta-percha tissue and lightly bound on. Wet dressings should only be employed for a few days, and then an ointment, paste, or cream containing zinc oxide should be continuously applied in the manner presently described.

In regard to baths in eczema, in most cases it is a good rule to forbid the use of water at all, except in the form of the dressing just described. But in acute or chronic eczemas, which are extensive, and when the patient is kept in bed superintended by a nurse, daily bran baths are often beneficial. The bran bath is made by soaking in the bath two or three pounds of bran

placed in a bag or pillow-case, and swirling it about until the water is thick. The patient is placed in this bath for ten minutes to a quarter of an hour. No soap is used, and immediately on coming out of the bath the skin is mopped with warm dry towels, and the dressing applied to the eczematous patches, after first dabbing them with lead and calamine lotion.

In subacute cases of eczema we may begin the treatment at once by the use of greasy applications. The ordinary zinc ointment of the Pharmacopœia is an excellent application, but the value of a zinc ointment is much enhanced by the addition of starch powder to form the well-known zinc oxide paste of Lassar: zinci oxidi ℥ij, pulv. amyli ℥ij, vaselini ℥ss.

The paste is spread upon butter-muslin (which can be bought at a draper's shop for a few pence a yard), and lightly bound on to the parts affected. The dressing should be changed once or twice in twenty-four hours. At each dressing it is important that the old zinc paste should be carefully removed. This should be done, not with water, but by gently wiping it off with a piece of wool soaked in a liquid vaselin (paraffinum liquidum B. P.). The dressing should never be allowed to get dry, and to prevent this happening it may be necessary to occasionally dab the butter-muslin from the outside with liquid vaselin.

If we can but insure that the skin is efficiently protected in this way, most eczemas will get well without further treatment. If improvement does not take place, there is some fault in the application of the dressings, or, as is very often the case, the patient is rubbing and scratching the patches.

In some cases which hang fire we may hasten the cure by means of drying-up applications. There are several ways of doing this, of which the best are:

1. To mop the eczematous patches with lead and calamine lotion at each change of dressing: Liq. plumbi subacet. ℥ss, glycerini ℥ss, calaminæ ℥j, zinci oxidi ℥j, aq. ad. ℨj.

2. To paint the patches every other day with a solution of silver nitrate: Argenti nitratis gr. x-xx, spirit. ætheris nitrosi ℥j.

3. To add to the zinc oxide paste, lenigallol in the proportion of ℥ss-℥j to ℨj.

The effect of the lenigallol (a derivative of pyrogallic acid) is to dry up the wet points, which become covered with little black crusts, and which later fall off and leave a dry surface.

For patches of eczema in parts where bandaging is difficult, the salve-mull zinc oxide of Beiersdorf & Co., No. 1011, may be employed instead of the zinc paste. This is a paste, spread on muslin, which may be cut into pieces of the desired size and stuck on to the patch.

In infants often the greatest difficulty will be experienced in preventing scratching and rubbing, and until this difficulty has been overcome no progress will be made. The zinc paste must be applied on a mask of butter-muslin with holes for the eyes, nose, and mouth, and lightly bound on. The child's arms must be put into splints, made by placing a roll of cardboard round the elbow so as to prevent the arms being flexed. The child can then move its arms, but cannot reach its face.

Most eczemas can be cured by careful attention to the protective measures just described, but there are a few further applications which are useful in special circumstances.

In chronic eczemas of the palms with much thickening of the epidermis, treatment may be commenced by the addition of salicylic acid gr. xx to ℨj of the zinc paste, using the simple paste after the epidermis has been peeled off. In erythematous eczemas of the face in adults, the lead and calamine lotion, already mentioned, may be mopped on several times daily, instead of using ointments. But care must be taken not to allow the powder in the lotion to get caked on, and this is best done by mopping with oatmeal water before each fresh application of lotion.

For chronic patches of eczemas *x*-ray applications are of great value, and will remove such patches when all other methods have failed.

EDITORIAL.

MEASURES FOR THE CONTROL OF SCARLET FEVER INFECTION.

For many years the view has been generally accepted by medical men that the desquamated particles of epiderm shed by a child convalescing from scarlet fever were the most active factors in spreading the disease. During the last decade, however, a number of writers have thrown doubt upon this belief, and some, who have had large opportunities for observation, have gone so far as to assert that the desquamating epiderm is devoid of this power. A question of this kind is of very great importance for obvious reasons. If the desquamated epiderm is not infectious in its nature the period of quarantine heretofore usually insisted upon can be materially shortened and much inconvenience and embarrassment avoided.

An interesting paper dealing with this subject is contributed to the *Medical Record* of February 15, 1913, by Mead. Summed up, the paper does not give us the definite and positive information which we would like to receive; that is to say, Dr. Mead is unable to conclude that the desquamations of scarlet fever are absolutely innocuous, but it is evident that the general trend of professional opinion is at least beginning to drift away form the old view toward the newer one. If the scales are not infectious, prolonged quarantine is not only unnecessary during the continuance of the desquamation, but there is little or no need for the employment of antiseptic oils or liniments, or other applications, to the surface of the body with the idea of controlling or preventing infection. In all probability the small amount of antiseptic substances which can be combined with oils, or placed in lotions, without irritating the skin prevent them from being materially efficacious, if the desquamated particles really contain the contagion. On the other hand, if fatty or oily substances are employed the spread of the dry desquamated particles is very materially controlled by reason of the stickiness or oiliness of the application.

The great difficulty in deciding this point lies in the fact that the bacteriologist is as yet unable to surely isolate the microörganism of this disease, and until it is isolated it is quite impossible by cultural methods and the employment of antiseptics to reach definite conclusions. As illustrative of divergent views concerning this matter the article upon scarlet fever in Osler's "Modern Medicine" may be quoted to the effect that there is abundant clinical proof that the epidermic scales have the power of communicating disease, as opposed to the statement in Welch and Schamberg's book upon "Acute Contagious Diseases" that the infection must reside somewhere in the body apart from the cutaneous surface.

Whatever may be the ultimate conclusion of the profession in regard to this matter, there seems to be a universally accepted opinion to the effect that the nasopharyngeal discharge of patients convalescing from scarlet fever is essentially infectious, and it is becoming more and more evident that physicians should pay greater attention to the possibility of the infection being spread by nasal or pharyngeal secretion. In other words, any child convalescing from scarlet fever that has a persistent nasopharyngeal discharge is probably an active disseminator of the infection, and it is probably true that applications of medicinal substances more or less active as healing agents or an antiseptic should be applied to the nasal cavities. Thus, antiseptic sprays or simple sprays of normal saline solution may be advantageous. Oily sprays containing minute amounts of eucalyptol or menthol or other volatile oils like sassafras or cinnamon may perhaps be useful. Or, again, after the nasal chambers have been cleansed by a spray of normal saline and the pharynx has been similarly treated, a few drops of liquid albolene may be dropped into the nose, and this in turn followed by a few drops of a ten-per-cent solution of argyrol.

Although we may not at this time be able to assert that the danger of infection through the skin is so slight as to be ignored we believe we are correct in our belief that the danger from nasal discharges, or from an ear which is discharging, as a result of scarlet fever, is far greater.

CHEMOTHERAPY IN TUBERCULOSIS.

For a number of years much interest has been felt in what Ehrlich calls "Chemotherapy," and his development of salvarsan and neosalvarsan as types of what chemotherapy can accomplish has called the attention of the profession in general to the possibilities of this line of scientific research. It is to be hoped that in the near future those qualified by special training for this work, whether in Ehrlich's laboratory or elsewhere, will be able to provide similar substances which will have a selective affinity for the protoplasm of organisms, which act deleteriously upon the human body, other than the spirochæta of syphilis.

At a recent meeting of the American Society of Pharmacology and Experimental Therapeutics Paul A. Lewis, of the Phipps Institute of Philadelphia, reported the preliminary investigations which he has been making upon this subject in connection with tuberculosis. Using trypan red, which, it will be remembered, was one of the substances originally employed against the trypanozome, and isamin blue, he found that the trypan red possessed in high degree the property of penetrating to the center of the experimental tubercle, while isamin blue became concentrated in its fibrous zone.

Continuing still further these investigations he examined a series of the anilin dyes to determine their penetrating power and vital staining properties. Congo red appreciably penetrated the caseous part of the tubercle when all the other tissues were colorless. With the assistance of Mr. Krauss modifications of trypan red were made with the thought of being able to change its activity. It was combined with iodine, thymol, eucalyptol, guaiacol, and iodoform. Seemingly there was no increase in the penetrating power of trypan red when fortified in this manner. While their investigations have not proceeded far enough to enable them to develop any substance which seems to be distinctly chemotherapeutic, they nevertheless have determined that neither trypan red, nor any modification so far studied, has had an appreciable influence in prolonging the course of the infection, or, in other words, it not only is not a cure but does not hold the disease in check. They have produced some substances which seem to inhibit tubercle formation, but when these substances have been employed the animals have died somewhat earlier than animals which did not receive them. In other words, their studies at the present time seem to be about at the stage reached by Ehrlich when he first began to go along the path which ultimately led him to such brilliant results.

SEA-BATHING AND CARDIOVASCULAR LESIONS.

During the summer season physicians are often consulted as to the wisdom of sea-bathing. Sometimes they are not consulted, but are called in to see patients who with a recollection of keen enjoyment of sea-bathing in early youth have attempted it when they were past the meridian of life, and have suffered from more or less severe symptoms in consequence. There can be no question that persons over fifty should resort to sea-bathing cautiously, particularly if the water is cold, and if there is present a condition of arteriocapillary fibrosis. In the presence of high blood-pressure sea-bathing is probably distinctly dangerous in direct proportion to the degree of disease in the heart and vessels. This is particularly true of surf-bathing, since not infrequently the patient has to resort to very active physical exercise, struggling to keep on his feet when buffeted by the surf. We

are free to admit that it is remarkable how few accidents of a circulatory nature are met with at the great bathing resorts, but possibly this is due to the fact that with advancing years the bathers become cautious and avoid the water when it is unduly cold. On the other hand, we have known several instances in which sudden death from acute cardiac dilatation has occurred in persons who have had tired hearts induced by high blood-pressure while surf-bathing, and possibly some of the cases in which death has been ascribed primarily to drowning are instances of cardiac failure due to overburdening of the heart by contraction of the peripheral capillaries on the one hand, and by the arm and chest movements resorted to in swimming, the primary cause of death being circulatory, although the final cause may be drowning when the patient is in a condition of syncope.

MECHANICAL MEANS OF TREATING CIRCULATORY FAILURE.

We have noted with interest a recommendation made in the *Lancet-Clinic* of February 15, 1913, by Lilienstein, of Bad Nauheim, Germany. In cases of weakened heart action, particularly in cases of failure of compensation, he applies to each arm two hollow cuffs connected with a manometer, attaching a rubber bulb exactly as when a single cuff is employed for the purpose of estimating blood-pressure. A pressure of 80 to 100 mm. in both cuffs is established. This does not entirely obliterate the pulse at the wrist, but materially impedes the venous flow from each arm. Lilienstein asserts that cardiac dyspnea, oppression, and fulness of the head is promptly relieved by this method, and reports cases in support of this plan. The condition which he induces he describes by the term "phlebostasis." The duration of the application is usually two to three minutes two or three times a day. The method, of course, is not curative but gives temporary relief, which when it occurs is most welcome. It does not in any way interfere with other methods of treatment by drugs or remedial measures other than drugs.

THE ACTION OF CAFFEINE ON THE CIRCULATION.

The exact position of caffeine as a circulatory stimulant does not seem as yet to have been exactly determined by the medical profession. On the continent of Europe it is used much more frequently and in much larger doses than in this country or in England. Indeed, in Russia and in France it seems to be not uncommon to give as much as from 5 to 15 grains at a dose, if we can believe some of the text-books which are published in those countries. In this country the dose is rarely greater than one or two grains four or five times a day, and very commonly is not more than one grain three or four times a day.

The attention of the public has within the last few years been called to the influence of caffeine upon the body in general, chiefly with the idea of asserting that it is a deleterious substance, but as readers of the GAZETTE are well aware, the careful investigations of many competent men during the last five years have shown that in moderate quantities it is harmless to the great majority oi individuals, and its wholesale ingestion in one form or another by a large proportion of the human race, civilized and uncivilized, living in countries scattered from the tropics to the poles, over many years would seem to indicate that this universal experiment, crude though it be, strongly indorses the necessarily more limited but more accurate studies in the laboratory and at the bedside.

At a recent meeting of the American Society of Pharmacology and Experimental Therapeutics, Salant reported the results he had obtained from the intravenous injection of caffeine into dogs, using a single dose, which was equivalent to the administration of from 3 to 12 grains of caffeine to a man weighing in the neighborhood of 150 pounds. He states that when given to an animal with a normally-acting heart this

dose has a stimulating effect, but larger doses in the presence of disturbed heart action may act as a cardiac depressant. He also found that when caffeine was administered simultaneously with or immediately after 10 to 20 per cent of alcohol, the depressant effect of the latter drug was corrected by the caffeine in the majority of instances, and also that the frequency of the cardiac contractions was increased without changing their force. Salant also found that doses of caffeine amounting to 30 grains or more to a man of 150 pounds, when injected into the stomach, had no effect on the heart, although cardiac depression was observed when such doses were introduced into the intestine.

There are several points of interest in connection with these experiments. In the first place it is a nice question as to whether the use of a dog for studying the action of caffeine is a happy choice, since in general terms carnivorous animals can scarcely be considered as approximately equivalent to omnivorous animals, which animals, like man, use a vegetable as well as a meat diet. Assuming, however, that experiments on the dog are equivalent, and also remembering that as the dog is carnivorous, a vegetable poison might be expected to act upon him more actively than upon man, it will be noted that Salant's work proves very conclusively that caffeine in the doses in which it is taken in this country is not depressant to the circulation. When it is considered that he injected into the jugular vein as much as is commonly taken in from 1½ to 6 cups of coffee, and found that a stimulating effect is produced, it is evident that when taken by the stomach, as man ordinarily ingests it, it cannot be harmful, the more so as he found that when the equivalent of 15 to 20 cups of coffee were injected into the stomach, the drug had no effect upon the heart. In other words, the doses which he used on the dog, injected directly into the veins, may fairly be considered distinctly toxic in their size as compared to the dose used for medicinal purposes or in coffee drinking.

THE SURGICAL TREATMENT OF MENINGITIS.

It must be acknowledged that in so far as treatment is concerned the attitude of the profession at large is one of distinct skepticism in regard to a possible betterment from surgical intervention, and even a greater disbelief in the efficiency of drugs, vaccines, or sera, the prognosis in both the acute and the chronic manifestations of meningitis being, except when the infection is localized and of known origin, usually bad.

Perhaps because of this skepticism in regard to any potential benefit to be derived from intervention, comparatively little attention had been devoted to the relief by surgical means of the pressure and toxic symptoms incident to the meningeal infection, and aside from a lumbar puncture done both for the diagnosis and the relief of headache there is little to be found in surgical literature upon which the earnest seeker after truth and after formulated practice can base his procedure. The contributions of Kopetzky and Haynes are therefore of more than ordinary interest, representing as these do careful studies from a clinical standpoint of a condition at present best understood from the records of the autopsy room. Kopetzky notes that the factors which underlie the clinical pictures are the same in all of the so-called types of meningitis. The results of infection of the tissues and fluids of the central nervous system are incident to the same tissue-reactions whether the pathogenic microbe in the given case is a meningococcus or a streptococcus, provided only that a sufficient number of the organisms gain a foothold and the results of their growth become operative on the tissues of their host.

As a result of this invasion of the fluids and tissues of the central nervous system, the available carbohydrate in the spinal fluid is used up and disappears from the fluid. The disappearance of the copper-reducing body, excepting in the slowly developing tuberculous meningeal infections, is prob-

ably the very earliest sign of the activity of the bacteria in the central nervous system. Thus there is afforded a means of diagnosis, in cases of suspected meningeal infection, which clearly differentiates meningitis from all other diseases whose clinical pictures give symptoms habitually referred to the meninges, as, for example, the meningeal signs of general sepsis (including otitic sepsis), the meningeal symptoms of pneumonia or typhoid fever, etc.

The underlying primal factor which influences the onset of the series of events constituting a vicious cycle remains as yet undetermined. We have an increased amount of cerebrospinal fluid, and an edema of the brain and meningeal tissues acting against each other within the limited available space of the cranial vault, both factors exerting a compression force on the blood and nutrient supply and thereby tending to further increase the edema; in the face of these conditions we are forced to accept, tentatively at least, the theory that in the use of certain constituents of the spinal fluid by the microbes as a dietary, a change in the composition of the fluid results, altering its tension, and thereby its permeability through the membranes of the cellular elements of the Pacchionian bodies, and that thus there results a stasis in the circulation of the cerebrospinal fluid—the first factor in the production of symptoms of meningitis.

The interference with the circulation of the cerebrospinal fluid and the compressed arterial blood supply produce an anemia, with the resultant picture of increased intracranial pressure. When the intracranial tension reaches a sufficient degree, the "fight for existence" of the vital centers starts, bringing in its train the significant signs from the vasomotor, the respiratory, and the vagus centers.

The symptoms of meningitis fall into two general subdivisions: (1) Those dependent on increased intracranial pressure; (2) those dependent on the growth of bacteria, and on the decomposition products thrown into the circulation from the disintegration of nervous tissue. The former more often than the latter determine the outcome in the given case. It is interesting to note that Soffian in reporting upon the epidemic of spinal meningitis in Texas observes that he reduced intracranial tension to as near normal as possible before injecting the serum, thus breaking the vicious cycle. This reduction of cerebrospinal tension followed by the use of serum gave results characterized as unusually good. Sladen has shown that the removal of 30 Cc. of fluid produced a marked reduction of pressure. It seems obvious that any procedure which places the control of the intracranial pressure within our grasp will be the logical surgical remedy for meningitis. Thereafter the added forces represented by sera, antitoxins, and chemical agents will find increased value in keeping in check the symptoms referable to the second subdivision of the symptomatology.

The early diagnosis according to Kopetzky, besides those manifestations of meningeal involvement generally recognized as such, lies in the repetition at short intervals of blood-pressure estimations; a progressive increase in which is the first significant sign.

As to an efficient method of reducing pressure this is suggested and has been practiced by Haynes (The Surgical Treatment of Meningitis: Its Scope and Accomplishment). He holds that all forms of meningitis are essentially septic in nature except the toxic, and this may become septic.

That all forms of meningitis kill, some only 10 per cent, others 100 per cent.

That death is caused in the last analysis by increased intracranial pressure progressing to such a point as to finally shut the blood off from the "vital centers."

That death can only be averted by furnishing good blood to the "vital centers" by removal of the intracranial pressure. Other appropriate and secondary measures will contribute to but cannot take the place of this paramount requirement. Irrespective, then, of the particular type of meningitis, of what has or has not been done before for therapeutic purposes, the indication for surgical action rests upon an unfailing chain

of symptoms that, in practice at the bedside, can be absolutely determined with accuracy.

These early symptoms are: (1) A rising blood-pressure, determined by the cardiac sphygmomanometer. (2) Edema of papillæ (not "choked disk," which is so late a symptom that it ceases to have any value). (3) Absence of carbohydrates from the cerebrospinal fluid (obtained by lumbar puncture). (4) An irritable or clouding sensorium.

In addition, there may be present a vagus pulse; respirations irregular in depth and rate.

With these pathognomonic symptoms present, no possible consideration can justify delay.

The nearer a patient is to bulbar paralysis the less likely that any operation will save life. Recovery from such compression may not be at all or slowly.

Haynes holds that the purpose of the operation is to open the cisterna magna, relieve intracranial pressure and restore the normal supply of "good blood" to the vital centers. The incision is in the middle line from the occipital protuberance to the spinous process of the axis, and carried down to the occipital bone and posterior arch of the atlas. He strips the periosteum from either side of the occipital bone, trephines in the midline about an inch from the margin of the foramen, and cuts away a piece of bone about one and a half inches vertically and an inch transversely at the foramen magnum, and a little less at the upper border. Thereafter the dura is opened, the arachnoid is punctured, and the cerebrospinal fluid allowed to escape slowly. As soon as the excess of fluid has escaped the arachnoid is opened widely, the lobes of the cerebellum are raised and separated, and the patency of the foramen of Magendie is assured. A small wick of gutta-percha tissue or rubber is placed within the margins of the dura and arachnoid and left protruding from the wound. The muscles are replaced and held together by two or three gut sutures. Voluminous dressings are applied. This operation opens the cisterna magna at its largest and most favorable spot for the evacuation of any fluid it may contain. Drainage established here effectually taps all other adjacent regions within and without the brain and cord. We do not seek to establish drainage merely to provide an exit for purulent cerebrospinal fluid, but to relieve intracranial pressure and restore blood to the vital centers.

Furthermore, once drainage is established, the fresh secretions of cerebrospinal fluid are more potent in their bactericidal elements than before, and every hour gained in life leads to greater probabilities of a complete cure. The operation is not complicated by the protrusion of the cerebellum into the cranial opening, as occurs in all other operations in the cerebellar fossa.

Meningeal infection is attended with an increased amount of cerebrospinal fluid. This causes great intracranial pressure. The cortical surface of the brain is crowded against the inner surface of the skull. A trephine opening made in the skull anywhere over the convexity of the brain (cerebrum or cerebellum), and the dura divided, the brain is crowded forcibly into the opening and tightly "corks it up." At the site of this operation, over the cisterna magna and between the lobes of the cerebellum, there is a normal gap or hiatus. The skull can be opened here in the presence of great intracranial pressure without a hernia cerebelli occurring or even a tendency to one appearing.

The entire central cerebellomedullary tract is under direct observation, and, if required, surgical treatment. Moreover, drains can be inserted, laterally if necessary, for draining the lateral fossæ on one or both sides. Should there be adhesions blocking up the foramen of Magendie, these can easily be broken up, merely separating the lobes of the cerebellum without disturbing the medulla. Plugging of the foramen magnum by the brain stem is impossible. The other varieties of operations suggested and performed in the suboccipital region do not drain.

Under secondary remedial measures Murphy's intermittent rectal saline enemas

continued over the first twenty-four hours are strongly commended. Autovaccines or antitoxins are of possible service. Large doses of hexamethylenamin are approved. This method of drainage is also commended in cases of basal fractures extending into the posterior fossa of the skull, particularly if infection has been added.

VACCINE AND SERUM TREATMENT.

The attitude of the profession at large toward the use of tuberculin in the treatment of tuberculosis has been one of skepticism as to the results achieved and of hope for the future, the skepticism being based upon the general failure of the method as employed by those without special skill, but gifted with ordinary common sense; the hope upon the sometimes brilliant results achieved by individual physicians who are firm believers in this form of treatment and who are further sufficiently trained to be skilled observers of clinical phenomena. It is true, however, that the verdict of the man who starts out with a fixed belief must be received with caution. A further element of hope is based on the expectation of the possible elaboration of a more potent vaccine. At the present time the results of clinical experiences, particularly if these be large and carefully followed, are of vivid interest to the entire profession. Hence Raw's report (*Liverpool Medico-Chirurgical Journal*, February, 1913) on 640 patients treated during the last fifteen years is of major importance, representing as it does a study conducted for a long period of time and with, apparently at the beginning, an entirely open mind as to the results to be expected. As to the variety of tuberculin employed, he selected from the many on the market Koch's new tuberculin bovine, and Koch's new tuberculin human, since he found them easily tolerated and not likely to produce general reactions. He also employed the mild method as advocated by Petruschky, Ehrlich, Guttman, and Goetsch, the object being to secure results without severe constitutional reactions, holding that this method possesses the following advantages:

By using the minutest doses reactions are avoided, and yet the highest and most potent doses may eventually be given.

It allows the severest forms of tuberculosis to be safely treated.

It allows the patient to carry out other forms of treatment, and even to attend to his ordinary light duties whilst receiving the treatment.

Tuberculin is given for the purpose of producing toxic immunity and a local hyperemia. Many of the subjective symptoms observed in tuberculosis are due to the absorption of toxins, and it is by no means uncommon to observe headache, loss of appetite, disturbed sleep, and general malaise to disappear after each injection of tuberculin. Many of the objective symptoms—such as fever, night sweats, quick pulse—yield to tuberculin, and when this treatment is associated with general life in a sanatorium the very best results are obtained.

Raw's dose is 1/100 of a milligramme of dried bacillary substance. On the other hand, he confesses that many of his patients whom he sent abroad to Switzerland, Germany, and Austria have returned to him apparently recovered, having received enormous doses of tuberculin at the hands of Continental physicians—in some cases even 20 milligrammes of dried bacillary bovine substance. As to the contraindications, he states that putting aside the incurable forms, especially those of severe mixed infection with pyrexia or the generalized infections, practically every uncomplicated case of tuberculosis may be submitted to tuberculin treatment provided that we commence with minute doses and carefully watch the effect.

Fever rising to 101° F. at night is a contraindication, and it is preferable to wait until the pyrexia is reduced before commencing tuberculin. Nor is it desirable to give the injections when there is a tendency to hemoptysis, since it is probable that even in the lung a local reaction follows the treatment, and if hemorrhage is taking place at the seat of infection it is not wise

to set up even the slightest local reaction. In the treatment of glands the remedy is particularly potent.

The beginning dose is .0001 mg. It is gradually increased with weekly repetitions until the final dose of .01 is reached, careful watch being kept for undue reaction as evidenced by fever. Especial attention is called to the need of being sure that there is no suppuration penned up in the body; otherwise the injection of tuberculin, by setting up a local activity in or near a tuberculous focus, may inadvertently liberate the bacilli and cause a general infection. All pus should therefore be liberated before any tuberculin is administered. As to whether the patient is going to be destroyed by tuberculosis, this is dependent upon the virulence of tuberculosis and the individual's resistance. In many cases the disease shows little tendency to progress in the body, so that it may exist for twenty or thirty years without destroying life or producing great crippling. In other instances it kills in two or three weeks. It is particularly in the avirulent cases that the tuberculin is of great service. As to glandular infection, so common in children, this Raw regards as practically always of bovine origin incident to tubercular milk, the first lodgment being in tonsils and carious teeth. As little as possible should be done with the knife. Where one large gland is involved and there is evidence of caseation it should be evacuated; and in the case of general suppuration with extensive periadenitis, free incisions to liberate pus should be made.

Goetsch lays down the rule that tuberculin is to be given only when there is little fever, that the dose should not be increased until the previous amount is tolerated without any reaction. The patient must rest in bed before the injection and for twenty-four hours afterward. Of the 175 cases treated by Goetsch in the last ten years 125 (or 71 per cent) have been cured, whilst the remaining 50 were improved. His cases were, however, all carefully selected and all in the early stage of the disease. The injection was given in a thoroughly cleanly manner, usually on the outer side of the forearm. When according to Raw the maximum dose of 1/100 part of a milligramme is reached, or 0.01 mg., it is never exceeded, but continued for several weeks. As a rule after the first two or three injections the patients feel better, the temperature drops to normal, the appetite is improved, and there is a feeling of general benefit. The special variety of tuberculin to be used must be determined by the nature of the infection with which we have to deal; and as nearly all cases of pulmonary tuberculosis or consumption are of human origin—that is, they are caused by the bacilli of the human type—it is necessary to use a tuberculin prepared from bacilli of the bovine type, this being less irritating and less likely to produce a reaction, and more complete immunity is produced by using tuberculin of the opposite type. It is further stated that the best treatment we can offer to-day is a prolonged open-air life, preferably in a well-conducted sanatorium, excess of nutritious food, gentle exercise followed by plenty of rest, and a course of tuberculin by a careful physician.

In this relation Rundle (*ibid.*) lays down the following laws for the use of tuberculin in pulmonary tuberculosis: When the temperature remains normal after a week's observation, begin tuberculin at once and increase the dosage rapidly. When the temperature rises to 99° or even 101° each day some of the most brilliant effects of tuberculin are seen. When the temperature is intermittent or markedly remittent, swinging through several degrees daily, pyrexia of this character suggests a superadded coccal infection which must be dealt with before a course of tuberculin is begun. Treatment by means of an autogenous vaccine prepared from the patient's sputum should hold out some prospect of success, but the isolation of the coccus at fault from sputum is obviously difficult and uncertain. Tuberculin is certainly of use in this type of case, but only when the secondary infection has been overcome. When there is a considerable rise of temperature

which is constant or occasionally remittent, the use of tuberculin may be attended by disastrous consequences.

Grace-Calvert (*ibid.*) records 106 cases in which he has given tuberculin, and four of those have developed meningitis. He reports on seven cases of this disease, all ending fatally, and observes that the clinical symptoms and signs in children are headache, vomiting, fever, backache, with optic neuritis and Kernig's sign. In the adult the onset may be very insidious and be characterized by a change in mentality and power of concentration, together with headache. Indeed a severe, persistent headache complicating any form of tuberculosis should always suggest the onset of meningitis. In optic neuritis, if Kernig's sign be present in addition, the diagnosis is almost certain. Fluid obtained by lumbar puncture will usually be strongly corroborative. There is an increase in quantity, it is slightly turbid, and contains an excess of lymphocytes. Usually tubercle bacilli are also found. In adults the disease seems to be invariably fatal. The duration is variable, and death may take place in a few days, or it may be delayed for several weeks. Headaches are relieved only by morphine. Spinal puncture sometimes seems helpful. This may be many times repeated. Small doses of tuberculin are suggested as theoretically advisable, repeated and increasing every third or fourth day, since it is important to produce an active immunity as soon as possible. In one case there seemed to be marked retrogression of symptoms under this method.

In regard to secondary infections in pulmonary tuberculosis McLellan (*ibid.*) notes that with all our boasted modern methods it is only in isolated clinics that more than 60 per cent of cases occur in which the disease is arrested, even though these cases exhibit only the early stage of the disease and are placed under the most favorable conditions as regards open air, etc.

The statistics of the intermediate and advanced cases are even more depressing. The report of the German sanatorium at Davos for the year 1910, after an average of 200 days' treatment, shows only 32.5 per cent of class two lost the tubercle bacilli from the sputum; whilst in class three it was as low as 14.2.

The disappearance of the tubercle bacilli does not indicate cure. It simply means that the patient has ceased to be infectious. The mortality in the four years following discharge from sanitaria has been found to be enormous. McLellan holds that a principal object of treatment is to prevent early or incipient cases, with no tubercle bacilli in the sputum, in which the infection is closed, from developing into open cases with sputum containing the bacilli; moreover, to arrest the progress of the open cases and render them non-infectious. It is usually recognized that the majority of symptoms of advanced tuberculosis are not due to the bacillus itself, but to the secondary infection. The evidence of this secondary infection implies careful attention to the nasopharyngeal passages, and rest in bed, preferably with continuous antiseptic inhalations.

McLellan after pointing out the difficulties in regulating the vaccine treatment of secondary infection, advises preparation of a vaccine from the more virulent organism found. If this be unsuccessful he would go on at once with mixed vaccine. In any vaccine it is a good rule to always start with a very small dose, and this particularly applies to the more acute cases. He does not consider it wise to administer tuberculin until the secondary infection is controlled.

Alexander (*ibid.*) holds that vaccine treatment depends upon the power of the patient to react to the immunizing stimulus, the identification of, and if possible the preparation of the vaccine from, the causal organism.

The correct dosage depends upon the virulence of the organism and the reactivity of the patient's tissues. The observance of the correct interval between doses depends upon the response to the dose, the interval and the dose being mutually interdependent.

Carnot recognizes three stages of blood infection. In the first stage the organism is shed from some focus—teeth, intestine, nose, or superficial wound—into the blood, causing a rigor, destruction of the bacteria, and clinically an acute but transitory headache and general malaise. In the second stage the weaker organisms die out soon after entering the blood-stream, but the more virulent individuals contrive to exist for some time. There is a preliminary rigor or shiver, and a later typhoid state which lasts from a few hours or days to a week or ten days, but clears up as the organisms eventually perish. In the third stage the organisms exist and develop in the blood. If the tissues are poisoned the bactericidal powers of the blood itself are depleted, and the picture now is identical with that of a septic endocarditis in its later stages. These three stages may succeed one another, with virulent infections in a period of hours or days. More usually they require months to produce a fatal result. In malaria it is recognized that a rigor signifies the incursion of sporulating parasites into the blood-plasma. Malaria being ruled out a rigor always signifies an incursion of organisms or their toxins into the blood-stream; if this were more generally recognized, malignant endocarditis would be diagnosed earlier.

The pneumococcus can be obtained by blood-culture in true pneumonia early in the attack; by the same method the typhoid bacillus can be recovered, in the first week of the disease, from 96 per cent of cases, from 50 per cent in the second week, and from 16 per cent in the third week. The working bacteriologist does not attempt a blood culture with much hope of success if the temperature be under 101° F. Most cases with a persistent leucopenia in bacterial diseases—a condition produced always and only by the permanence of organisms in the circulating blood—terminate fatally. If the leucopenia alternates with the leucocytosis there is sufficient evidence of a tissue reaction, and a dose of vaccine may excite response. If the leucopenia is permanent and no fluctuations occur in any of the various types of white cells in relation to intermissions of temperature, the tissues are poisoned beyond hope. Alexander admits that staphylococcus aureus causes most boils and many cases of osteomyelitis, and that a stock vaccine produces quite excellent results in many of these cases. He also admits that gonococcal infections can be diagnosed clinically and that a stock gonococcal vaccine rarely produces any result. But, having admitted the possibility of correct clinical diagnosis in these two infections, there is no other infection that can with safety and accuracy be diagnosed without the aid of bacteriological methods.

For instance, pneumonia is caused by the pneumococcus in only 50 to 60 per cent of cases clinically. Hence in at least 40 per cent of pneumonias a pneumococcal vaccine is useless. But pneumococcal vaccines are administered right and left in every case of so-called pneumonia even by mouth, and when no effect is produced the result is not attributed to ignorance but to the utter worthlessness of vaccine therapy.

If the mistaken percentage in pneumonia is 40 per cent, the corresponding number for B. coli infections is at least 1000 per cent.

Even with six tests formulated by M'Conkey, dependent mainly upon the production of acid and gas in sugar media, there may be theoretically 200 odd varieties of the coli group, none of which are true B. coli. One hundred and fifty varieties have been isolated and described. If the polyvalent B. coli vaccine be prepared it contains ten strains of the manufacturer's idea of what B. coli ought to be. If a B. coli serum be employed, the animal which furnishes it has been immunized with not more than ten or a dozen strains. A blunderbuss was popular in the Georgian era because its orifice was wide and its pellets outnumbered the assailants at whom it was aimed. But the polyvalent vaccine fulfils none of these functions. Its pellets in the case of the coliform organisms are outnumbered by at least fifteen to one, and the 150 of the enemy remain unharmed. Although it is

easy to obtain many strains of coli variants from the same case, it is difficult to determine which of the varieties isolated is the organism causing the symptoms. The task of preparing the vaccine from the important organism, which unfortunately is not invariably the predominant organism, is one of the most difficult falling to the lot of a bacteriologist.

Alexander summarizes his observations, which have been quoted in full, to the effect that there is no such thing as a B. coli in human infections. The organisms which produce grave lesions in human beings form the brothers and sisters, cousins and second cousins, of the original B. coli—Metchnikoff terms them the "wild races"—and it is unwise to speak of B. coli, but perfectly safe to speak of a coliform organism. In regard to the streptococci, the evidence agrees in respect to the existence of different species of streptococci, and this in itself is inimical to the production of beneficial results by stock vaccines. The position here is not, however, so utterly hopeless as the one described under the heading of B. coli. The individuals of the streptococcal group cannot be so easily distinguished by chemical tests as were the coliform organisms, though animal inoculations aid in their differentiation. Hence a polyvalent streptococcal vaccine has an infinitely better chance of eliciting a beneficial response than any coli serum or vaccine. Streptococcal stock vaccines are rarely given, because there is a valuable serum prepared from this organism. It is used largely and promptly in early and late cases of clinical streptococcal infections. The percentage in which good results have been produced is small compared with the total number of cases so treated. It is not denied that stock vaccines of some organisms are useful, but of what use would they be to a man whose knowledge informs him that all pneumonias are pneumococcal, all appendicitis is due to B. coli, that there is only one streptococcus, and that the obscure cases require either "606" or tuberculin? Hence vaccines are given to patients whose tissues are poisoned beyond all power of reaction, and the wrong stock vaccines are administered to those who are in a fit condition to benefit by the proper organism.

As to the correct dose, in the first place it is individual, and depends upon the reactivity of the patient and the virulence of the organism. Hence all initial doses must be small. Effective doses are those which may produce a local reaction and may produce a general reaction, but do produce a focal reaction, slight or severe. The interval depends entirely upon the focal reaction—this term meaning the disturbance at the seat of disease. Local signifies the reaction at the site of injection; general, such symptoms as headache, nausea, rise of temperature, numbness of extremities, etc. The local and the general reactions are by-products. They usually run parallel with the focal reaction; but if they do not, they are to be disregarded in favor of the evidence furnished by the diseased spot itself.

It is the custom in vaccine therapy to administer doses which will carry the patient over into the following week. Occasionally cases are seen in which the maximum dose is obtained very early, and any increase produces disastrous effects. Successful results can only be obtained under such circumstances by gradually decreasing the intervals until finally a larger dose may be adventured. The motto of vaccine therapy is progression, and this may signify either increase in dose or diminution of intervals, preferably increase of the dose, since it has been proven that diminution of interval is not so effective. The doses attained in the treatment of chronic cases are sometimes very large. A dose of twelve thousand million staphylococci (aureus) has been given to a patient at weekly intervals; in this case no improvement was seen until the six thousand million mark was reached. The chief errors which are perpetrated are the want of an early and accurate bacteriological diagnosis, the use of stock vaccine in undiagnosed conditions, and the administration of vaccines without any regard for the reaction, the interval, and the progression of the patient's immunity.

REPORTS ON THERAPEUTIC PROGRESS.

POSTOPERATIVE GASTROENTERIC PARESIS.

PILCHER writes on this topic in the *New York Medical Record* of March 1, 1913. He says treatment may be considered under the captions Prophylactic and Active.

Prophylactic Treatment. — Thorough evacuation of the intestines before operation. The intramuscular or intravenous injection of 20 to 40 Cc. of hormonal before operation in suitable cases. A minimum manipulation of the intra-abdominal structures, particularly those in the upper abdomen. The introduction of two quarts of saline solution at 110° F. into the rectum in a lithotomy position at the conclusion of all intra-abdominal operations. A minimum use of ether or chloroform and administration by the open method, and the introduction of 2 ounces of olive oil into the mouth shortly after the patient's reflexes have become reëstablished.

Active treatment consists primarily of immediate lavage of the stomach, early, repeated, and prolonged. No matter how piteously the patient may beg to be let alone it must be done. There is no existent contraindication to its use. Any tube which can be most conveniently passed into the stomach is the right one, and any non-toxic solution the correct one. Warm water to which has been added sodium bicarbonate, 1 drachm to the quart, is perhaps the most efficacious. The lavage must be continued until the return is clear and be repeated at the first evidence of redistention, continued nausea, or a return of regurgitation. Stimulating enemata, such as turpentine, milk and molasses, or alum, should then be employed. These procedures may alone be sufficient to relieve the condition, if the paresis has been of short duration, but there is a certain class of patients who are more resistant, in whom the stomach refuses to empty itself and the peristalsis of the bowel does not become reëstablished.

Medical Treatment.—Heretofore, injections of eserine sulphate or of salicylate, grain 1/40, repeated as necessary, have been used in these cases, with favorable results eventually in some cases after prolonged discomfort on the patient's part. In certain recent cases he has employed an intravenous injection of 20 to 40 Cc. of hormonal (which is a peristaltic hormone discovered lately by Zuelzer). Thus far his experience in its use has been most fortunate. Those, however, who have employed it more extensively, particularly in clinical work (chronic obstipation), report that in approximately 25 per cent of the cases it fails to act. However, if it is going to act its results are quickly appreciated, and it seems to be fairly innocuous when properly administered. In some patients with chronic bowel atony and habitual constipation the results have been most remarkable, but seem rather evanescent.

Before employing this agent in cases of postoperative gastroenteric paresis, occasion was taken to verify by animal experimentation the efficiency of this peristaltic hormone, for which purpose rabbits were used. By injecting intravenously amounts varying from 3 to 7 Cc., they were able to conclusively demonstrate that a physiological peristalsis was evoked, varying in degree, however, in different animals. In control of these observations, eserine salicylate, grain 1/130, was similarly injected intravenously, from which administration spastic contractions of the intestine were noted to occur, which incisures remained for some time with but little propulsion of the bowel contents in some instances. Certainly its action was in no way a reproduction of physiological peristalsis, but seemed to affect more the circular musculature, while that resulting from hormonal appeared to affect only the longitudinal fibers.

Under no circumstances whatever should any cathartics be employed until after the stomach has been thoroughly evacuated, as the retained secretions become after a very short time exceedingly toxic, and if success should crown the efforts of the surgeon

to effect a large, bland-smelling green or grumous stool, it has been the experience of many that while felicitations and congratulations are being indulged in, return to the bedside will be rewarded by seeing the patient die suddenly as the result of intestinal absorption of its toxic contents.

Instillation of warm saline solution per rectum by the drop method is frequently an important adjunct, especially in assuaging thirst, as but very small amounts of water should be allowed by mouth even after the condition is relieved, and the diet for several days should be practically dry.

Treatment by posture has been advocated by many, exclusively by some, particularly those upholding the mechanical theory, while others have combined it with lavage. The knee-chest position or ventral decubitus will, however, not appeal to most surgeons in the treatment of immediate postoperative cases, and the patient will most certainly object.

Operative treatment, although still undertaken by some, had best be discontinued as its results thus far show a mortality of practically 100 per cent, and when one stops to consider what the condition is that is being dealt with, he will realize that the reason for his failures is because he is adding insult to injury.

THE LUETIN SKIN TEST IN THE DIAGNOSIS OF SYPHILIS.

In the *Medical Record* of March 1, 1913, RYTINA writes on this important topic. He describes the preparation of the cultures for the cutaneous reaction as follows:

Briefly stated, luetin is nothing but an emulsion of dead S. pallidæ, and the control is composed of the same constituents as the luetin, minus the pallida. In order to secure the polyvalent antigen, six different strains of the spirochætæ are employed. Noguchi prepares it as follows: Cultures are allowed to grow for periods of six, twelve, twenty-four, and fifty days at 37° C. under anaerobic conditions. One is grown in ascitic fluid to which a piece of sterile placenta has been added, and the other in ascitic fluid-agar also containing placenta. The lower portion of each solid culture in which a dense growth occurs is cut out and the tissue removed. The agar columns which contain innumerable spirochætæ are then carefully ground in a sterile mortar, and the resulting thick paste is gradually diluted by adding little by little the fluid culture, which also contains an enormous mass of organisms. The dilution is continued until the emulsion becomes perfectly liquid. The preparation is next heated to 60° C. for sixty minutes in a water-bath and then 0.5 trikresol added. When examined under the dark ground illuminator, many dead pallida per field can be seen. Cultures made from this suspension remain sterile, and with them no infection can be produced in the testicles of rabbits. The suspension is kept in a refrigerator when not in use. In order to ascertain if the reaction produced with the suspension might not be due to inoculation of the trikresolized culture medium alone, it is necessary to prepare a similar emulsion with uninoculated media to be used for control purposes.

Technique and Method of Application.—To the luetin at the time of application an equal amount of normal sterile salt solution is added, and the injection is made intradermically in the right arm, previously well sponged with alcohol. The amount injected, with a very fine needle, .07 Cc. for adults, 05 Cc. for children, is accurately measured and the proper application evidenced by a small, raised, blanched papule, which subsides in about ten minutes. The control is prepared and injected in the same manner in the left arm. For the control, Pilcher employs a one cubic centimeter tuberculin syringe and for the luetin a half cubic centimeter tuberculin syringe. In the latter the graduations are wider, making measurements easier and more accurate. Further, it avoids any possible confusion between the two. Separate sterilized pipettes, tubes, etc., are kept for the luetin and control, thereby preventing contamination.

Up to the present time they have given 150 to 200 luetin injections, but in the present study they are only including such

cases as have been followed to a positive termination or watched over a period of at least thirty-six days. The number of such cases is 117.

Description of the Reactions.—Noguchi's apt classification is followed.

Normal or Negative Reactions.—After about twenty-four hours, in practically one-half of Rytina's normal or negative cases, nothing except a slight erythema at the site of injection appeared. In forty-eight hours this had practically disappeared. In the other half, after twenty-four hours, there was a definite raised, indurated, papular formation, surrounded by a more or less marked erythematous zone. The beginner in luetin work will at once predict a positive reaction for this patient. This gradually recedes, however, so that by the fifth day, with the exception of a slight pigmentation, nothing more may be noted. On this account reactions appearing at this early period have no diagnostic significance. They are due to the irritation caused by the injection of the foreign material. In a smaller group of cases, however, an eruption presenting the following characteristics appeared. After twenty-four hours, a small, raised, red, indurated papule appeared surrounded by a definite erythematous zone. After forty-eight hours the erythematous zone would disappear, leaving the papule, which would persist as long as two weeks or more, showing only a change in color from red to dark red, then a purplish hue. No pain or itching was complained of. In his early experiences Rytina was in doubt as to the correct interpretation of these lesions, particularly as they were in types of syphilitics in whom the positive reaction is found with the greatest frequency, viz., tertiary lues. At the time he recorded these as doubtful positive reactions. Later on some of these developed at the site of the doubtful reaction lesions of the torpid form of reaction, to be described later. In the beginning of his work most of the patients injected were syphilitic, and in order to elucidate this point further and determine if a similar doubtful reaction could be produced in non-luetic individuals, he injected twenty-eight persons who were thought to be normal or suffering with other diseases than syphilis. The experience in these cases showed that in none was there after four or five days anything except a slight pigmentation of the skin to indicate the site of the former injection. As Noguchi does not mention this phenomenon, Rytina is impelled to record these eruptions as mildly positive reactions.

Positive Reactions—Papular Form.—Twenty-four to forty-eight hours after the injection a large, red, raised, indurated papule, 5 to 10 mm. in diameter, appears. The papule may be surrounded by a zone of erythema, which may also appear slightly edematous. The papule, instead of slowly receding, gradually progresses for the next two or three days, becoming dark or bluish red, when it gradually subsides, disappearing completely within seven to ten days. Evidence of it may persist, however, as long as two or three weeks. In their series the papular form of eruption was noted three times in secondary lues, six times in tertiary, and once in parasyphilis; total, ten.

Pustular Form.—In this form for the first four or five days the lesions will assume the papillary type. After this the surface of the indurated papule will become capped by small vesicles and a beginning central softening will be noted.

After a short time the papule becomes definitely pustular, containing at its apex at first a semiopaque serum, which later becomes definitely purulent. Pain and itching more or less severe may be complained of. This later ruptures, either spontaneously or by rubbing against the sleeve, leaving an opening surrounded by the indurated margin of the pustule. The gap left by the discharge of pus becomes quickly covered by a scaly crust, which falls off in a few days. The induration gradually subsides, with little or no scar formation. But a pigmentation remains, which may persist for several months. Some of the pustular lesions, instead of breaking down, present a small, central, soft, red, fluctuating mass which is gradually reabsorbed. The number of cases of this type in their series was one in primary, two in secondary, nine in

tertiary, and three in parasyphilis; total, fifteen.

Torpid Form.—In this form the injection site fades away after three or four days, so that the case is recorded as a negative reaction, when suddenly it reappears and progresses to papular or pustular formation, following the course of the types described above. Noguchi regards this type as a rare form, but Rytina asserts he has seen it four times in secondary, five times in tertiary, once in latent, and once in hereditary syphilis—total eleven, or 9.3 per cent of cases recorded. The cause of this rather large percentage of the torpid form in their series is due, he believes, to the neosalvarsan injections, which often follow the luetin test. In one case it did not appear until thirty-six days after the injection. The earliest it appeared was eight days, the average time being fifteen days. On this account he does not consider any injection negative unless the patient has been observed for a period of at least thirty-six days. His plan is to make daily observations for five or six days, and if at this time the reaction is negative the patient is instructed, if he is an ambulant case, to report every few days, unless he notes the site of injection again flaring up, when he is to report on the same day. Rytina states he has seen no constitutional reaction, excepting a slight rise of temperature, 99° to 100° F., and a slight transient headache.

In connection with the various types of eruptions appearing in positive cases, it is interesting to note the changes appearing at the site of the control injection. In fourteen cases the control site evidenced changes of the same character as on the opposite side, viz., a papular or pustular formation. The lesions are usually, but not always, of a similar character as on the opposite side, although in five cases they were more pronounced than at the site of the luetin injections. One of these, a case of tertiary syphilis, presented a lesion characterized by a broad, rounded, erythematous zone, in the center of which was a sharply circumscribed, hemorrhagic pustule, about the size of a large pea. A few days later he developed a similar reaction on the right or luetin side. The control side ruptured, discharging a dark grumous material, whereas that on the luetin side was reabsorbed without rupture. This same phenomenon has been observed by Wolfsohn and Robinson. The cause of the reaction on the control side is due to the peculiarity of the skin of syphilitics, especially tertiary syphilitics, to be prone to infection and traumatic irritation. This is a fact often commented upon by dermatologists and surgeons. For an explanation of this phenomenon Finger advanced the theory of superinfection. He presupposes that, following the trauma, owing to a point of least resistance being presented, syphilitic virus is deposited there and produces the lesion. On the contrary, Neisser after failing to find the spirochæta pallida in the lesions, attributed the cause to a peculiar pathological condition of the skin of syphilitics, which he has termed "Umstimmung." That this condition exists is quite evident, as in none of his non-luetic cases has Rytina once observed such a reaction. But the most interesting cases of this character were those, numbering two, in which a typical reaction appeared on the control side, with a negative reaction on the luetin side. Care was taken to avoid contamination, injection into the wrong arm, etc. The theory of infection was eliminated as a causative factor on account of the time of appearance, eight and seven days respectively, and the papular form in one, typical in every way. He attributed the cause of the reaction in these cases to the state of "Umstimmung." To determine, however, this point more fully, twenty-five persons who were either normal or suffering with some disease other than syphilis were injected in both arms with the control only. The reaction was negative in all.

CONCLUSIONS.

1. The luetin is entirely harmless.
2. It is specific.
3. While the technique is comparatively easy and could be still more simplified by putting up in ampoules the full dose, ready for use, it requires a little practice and ex-

perience to make the application properly and interpret correctly the mild form of positive reaction.

4. It is mostly negative in primary and secondary untreated cases, but shows a large percentage of positive reactions, in such cases, receiving previous treatment.

5. In congenital, latent, and tertiary syphilis it is practically 100 per cent positive. In parasyphilis it is positive in a large percentage of cases.

6. The luetin test is less constant than the Wassermann reaction in primary and secondary syphilis, but possesses greater value as a diagnostic agent than the latter in tertiary, latent, and congenital cases and parasyphilis. Furthermore, it possesses greater prognostic significance than the Wassermann reaction in determining when syphilis is cured.

TABLETS OF EMETINE IN THE TREATMENT OF AMEBIC DYSENTERY.

It may be remembered that in 1858, Surgeon E. S. Docker, A.M.S., then stationed in Mauritius, first advocated the use of large doses of ipecacuanha in dysentery, and succeeded in reducing the dysenteric death-rate in the island from 10 to 18 per cent to 2 per cent. The more recent investigations of Major Leonard Rogers are fresh in every one's mind, and have demonstrated that the salts of emetine are specific in amebic forms of dysentery, and that, moreover, they can be given with safety without inducing the serious nausea and vomiting characteristic of ipecacuanha. In one case, an amount of emetine corresponding in four weeks to 1000 grains of ipecacuanha was well borne.

That ipecacuanha should have been so suddenly and so dramatically rehabilitated is one of the surprises of science when we recall that not very many years ago its use on active service was seriously banned by a committee of experts sitting in London. The investigations of Vedder, an American officer stationed in the Philippines, formed a fresh starting-point. Vedder found that fluid extract of ipecacuanha inhibited the growth of dysenteric amebæ *in vitro*—later furnishing the observation that broth-cultures of dysenteric amebæ were destroyed by emetine. Upon these facts Rogers seized, with keen perception of the practical clinical application of the discovery. "I therefore," he says, "tested the effects of the solutions of emetine on *A. Histolytica* in dysenteric stools." All the force of Rogers's investigations lies in these last three words. He found, in point of fact, that amebæ in dysenteric stools were killed by a dilution of 1 in 10,000 of emetine hydrochloride, and rendered inactive even by so high a dilution as 1 in 100,000. Microscopic examination of the dysenteric ulcers of an advanced case which ended fatally failed to reveal a single living ameba, after a dosage of 3½ grains in 2½ days.

The keratin-coated product of emetine constitutes yet another advance, and has been introduced in order to enable the hydrochloride to be given orally. The keratin coating facilitates the contents of the product reaching the pathogenic areas of the bowel, unimpaired in activity and without interfering with gastric processes. Tablet emetine hydrochloride, gr. ½, keratin-coated, is especially suitable for routine treatment in dispensary and out-patient work, since it enables the patient to take the remedy himself.—*Indian Medical Gazette*, February, 1913.

FREE FEEDING IN TYPHOID FEVER.

In the *Medical Record* of March 22, 1913, SICARD contributes a paper upon this subject. After quoting a number of authorities who have written upon this subject in recent years, many or most of which we have referred to in leading articles in previous issues of the GAZETTE, he points out the inadequacy of milk diet, which he thinks should be employed only during the first week of the disease. The administration of 6 ounces of milk every three hours, or about one and a half quarts of milk in twenty-four hours, gives a caloric value of 1000. This is increased day by day until at the end of a week the patient is taking

2 quarts of milk, 8 ounces of cream, and 2½ ounces of sugar solution, which equals about 2212 calories. He well points out that alcohol is isodynamic with 23 grammes of fat and 52 grammes of carbohydrates, regarding it evidently as valuable from the standpoint of a foodstuff and as a stimulant. With the beginning of the second week the following scheme is instituted. It will be noted that 3000 calories is supposed to be the amount required by a man performing fairly severe labor. Sicard's plan, therefore, practically considers that a man suffering from fever is undergoing the same tissue waste as a man under severe toil, and he believes that as much as 4500 calories can be given a day with advantage.

In seven feedings, at 9 A.M., 1, 3, 7, 9, 12 P.M. and 4 A.M., each feeding consisting of:

Milk	180 Cc.	6 ounces.
Cream	15 Cc.	½ ounce.
Milk sugar	15 Cc.	½ ounce.

At 7 A.M.:

Toast (one slice)			80 calories.
Butter	15 gm.	½ ounce.	100 calories.
Egg (one)			80 calories.

At 11 A.M:

Egg (one)			80 calories.
Bread (without crust)			100 calories.
Butter	15 gm.	½ ounce.	100 calories.
Junket	180 gm.	6 ounces.	200 calories.

At 5 P.M.:

Toast			80 calories.
Butter	15 gm.	½ ounce.	100 calories.
Cereal	90 gm.	3 ounces.	100 calories.
Cream	60 gm.	2 ounces.	120 calories.
Milk sugar	15 gm.	½ ounce.	60 calories.
Total calories			2950

By the gradual addition of different foods the fuel value is raised after a few days to 4000 calories, as follows:

Milk	1500 Cc.	1½ quarts.	1000 calories.
Cream	420 Cc.	16 ounces.	480 calories.
Milk sugar	70 gm.	2½ ounces.	280 calories.

In seven feedings, at 9 A.M., 1, 3, 7, 10 P.M., 1 and 4 A.M., each feeding to consist of:

Milk	180 Cc.	6 ounces.
Cream	60 Cc.	2 ounces.
Milk sugar	10 gm.	2½ drachms sugar sol.

At 7 A.M.:

Egg (one)			80 calories.
Toast (one slice)			80 calories.
Butter	15 gm.	½ ounce.	100 calories.
Coffee			
Cream	60 Cc.	2 ounces.	120 calories.
Lactose	15 gm.	½ ounce.	60 calories.

At 11 A.M.:

Egg (one)			80 calories.
Toast or bread			180 calories.
Butter	15 gm.	½ ounce.	100 calories.
Mashed potato	15 gm.	½ ounce.	15 calories.
Custard	120 gm.	4 ounces.	250 calories.
Coffee			
Cream	60 gm.	2 ounces.	120 calories.
Lactose	15 gm.	½ ounce.	60 calories.

At 5 P.M.:

Egg (one)			80 calories.
Cereal			100 calories.
Cream	60 gm.		120 calories.
Apple sauce	30 gm.		30 calories.
Tea			
Cream	60 gm.		120 calories.
Lactose	15 gm.		60 calories.
Total calories			3770

For still higher values we give the following 4500 calories:

Milk	1260 Cc.	860 calories.
Cream	420 Cc.	840 calories.
Milk sugar	105 gm.	440 calories.

This is given in seven feedings, 9 A.M., 1, 3, 7, 10 P.M., 1, and 4 A.M. By doubling the bread, butter, cream, and milk sugar in the foregoing table, 4500 calories may be given.

Although we have quoted most of the following facts from the authors cited by Sicard, a summary of their views presented by him in his paper is well worthy of repetition:

Weight.—The loss of weight depends, generally speaking, upon the amount of food taken; under the old period of fluid diet, patients lost from 15 to 25 or more pounds during their illness; but with sufficient food the loss is rarely more than 10 pounds in severe cases; in moderately severe cases the loss is slight, and not infrequently patients will gain weight. As examples of this maintenance of weight, one patient lost 5 pounds in a febrile period of forty-four days; another, during the relapse of a fifty-three-day period, gained 3 pounds; another lost 2 pounds in the relapse of a fifty-five-day period; one gained 6 pounds during a febrile period of thirty-eight days; another lost 3 pounds in a twenty-one-day period. These losses are all insignificant. Most patients will show considerable loss before coming under observation, but after the diet is established the weight can be held within a few pounds in practically all cases, and when allowed

out of bed all patients weigh considerably more than on admission.

Vomiting seldom proves a contraindication to the feeding of high fuel values; if any article proves to be distasteful, the patient will soon complain of it and it can be stopped; if vomiting continues the diet is to be stopped until the stomach is quiet, and then resumed; one of Sicard's patients took and enjoyed 3500 calories after suspension of food for vomiting. Severe and persistent vomiting from intoxication makes a different complication, as patients vomit frequently, either everything taken, or else vomit often and seemingly regardless of any particular article. They had one man severely ill and of prolonged course who vomited frequently, but not always the same article of food, and was as apt to vomit water as anything else; this patient was vomiting before admission, and it was not due to indiscretion in feeding but to toxicity; he finally died after an illness of fifty-three days, vomiting until the end. Toxic vomiting is always a bad sign and augurs trouble.

Diarrhea is not common; it may be due to an excess of fat, which can be easily stopped.

Distention, if due to milk sugar, is not relieved by the ordinary means, so the sugar can be reduced; these conditions are not common, however, as patients get accustomed to fat and milk sugar and take and handle them well.

Hemorrhage.—In the twenty-nine cases cited here there were four cases of hemorrhage, two of which were large and fatal; one of these was an alcoholic subject who had delirium tremens on admission. Hemorrhage occurred in 11 per cent of Coleman's cases, only one dying, however. To quote Coleman's opinion of hemorrhage: "If the patient be in good nutrition the loss of blood affects him no more than it does a healthy man."

Relapse.—Rudisch found the number of relapses to be 8.4 per cent among 974 cases, prior to the time of high caloric feeding. Kinnicutt, in an examination of 600 liberally fed, found relapse no more common than with a low diet, which is variably estimated at from 8 to 12 per cent. Coleman had 20 per cent of relapses among his 111 cases from the Second Division of Bellevue Hospital, but upon investigating the number in the other divisions of the hospital for the same time found these to be 26 per cent, so he concludes that high caloric feeding has but slight influence on the incidence of relapse. Sicard's own feeling is that it makes but little difference; cases liberally fed and those lightly fed seem to relapse equally; there were four relapses in his twenty-nine cases.

Perforation.—He had no cases. Crohn reported none in the Mt. Sinai cases. Coleman had one in 111 cases.

Convalescence.—Crohn reports that the cases treated at Mt. Sinai Hospital, New York, were allowed to sit up in bed the day the temperature struck normal, and that one or two days after this they were allowed up in a chair; that ten to fourteen days after reaching normal they were discharged from the hospital. He has had no experience with such short periods of convalescence as this, but he does know that the time is shortened and the tedium much relieved. He cannot see that liberal feeding makes any difference in the duration of the illness; they had cases of thirty-eight, forty-four, forty-six, fifty-three, and fifty-five days' duration, fed from 3500 to 4500 calories.

Of complications other than those named above, there was one phlebitis and one cholecystitis.

Mortality.—In speaking of this subject Sicard can do no better than quote Coleman's figures of the cases occurring in Bellevue and allied hospitals from 1907 to 1910 inclusive. There were 102 cases liberally fed, with a mortality of 10.7 per cent; there were 773 cases fed otherwise, with a death-rate of 16.5 per cent. These cases all occurred during the same years and were taken from the same institutions, drawing the same class of society. Of his twenty-nine cases, three died, approximately 10 per cent; of these one died of hemorrhage, one other also died of hemorrhage who was

alcoholic and who was on a low caloric diet only; one died who had persistent vomiting both before and after admission, and who had but little feeding of any kind.

Conclusions.—The feeding of high fuel values show a cleaner, moister tongue, more comfortable mouth, less offensive breath, less emaciation, less nervous exhaustion, which was shown by continuous muttering and constant picking at the bedclothes, a cleaner, healthier skin, greater comfort, less diarrhea, probably lessened mortality, and fewer complications. The most evident features of the high caloric feeding are the sustenance of weight and nutrition, the amelioration of hunger, and the lessened tedium of convalescence.

THE USE OF QUININE IN HEMOGLOBINURIC FEVER.

LONG in the *Charlotte Medical Journal* for March, 1913, writes on this subject. He expresses the belief that if quinine can be given from the very first, before the blood-making centers have become partially exhausted and before the patient's vital resistance is worn out by prolonged toxemia, and if the patient is strong enough to live through the crisis which is absolutely certain to follow its administration, quinine can be given with probably a more rapid recovery following than if it be withheld. But if the patient is seen for the first time at all late in the attack, or his vitality is wasted by chronic malaria, cachexia, or other disease, the chances are against his living through the "quinine crisis," as it is convenient to call it. If the patient is seen for the first time on the day after the attack, quinine is out of the question, because hemoglobinuric fever itself is not amenable to quinine, as Deaderick plainly states. To begin with, the patient does not need it, because the greater portion of the parasites have been destroyed, and quinine has no effect on the toxins from which the patient is now suffering, and only adds to the load on the excretory organs, which are already overworked; but the fact that there are no parasites to destroy will in no wise detract from the harmful effect of the drug on the red cells, for we must remember when we give quinine in this condition we supply the one thing necessary to form a substance which is just as toxic to erythrocytes as it is to parasites. Mannaberg's series of examinations show that on the day after the attack the parasites were present in the blood in only 17.1 per cent of cases, while on the day of the attack and the day before the attack they were present in 63 per cent and 95.6 per cent respectively. After the day of the attack the parasites are mostly destroyed anyway, and about the only thing the quinine can do is to cause hemolysis of what blood the poor fellow has left, and put him to the trouble of excreting it at a time when he can hardly excrete enough malarial poison to keep himself alive.

The chills or "rigors" occurring during the attack are not the result of sporulation of the parasites, as has been supposed, but may be regarded as having their origin in the mingled toxic products of the broken-down parasites and red cells. These rigors have no periodicity and are liable to come on at any time following a chill or exertion of any kind, or from anything which temporarily lowers the resistance of the patient. They are almost invariably followed by an increase of the hemoglobinuria and general aggravation of the symptoms, but this can hardly be regarded as the effect of the rigor. They are, of course, to be guarded against and are combated by external heat, quiet, induced by an opiate if necessary, and the use of a bed-pan. Rapid elimination, where possible, is of course the best method of preventing these rigors.

That quinine should be given in large doses or not at all is, it is believed, the consensus of opinion, and this certainly works in with the hypothesis which the author has attempted to present. He adds that it should be given early or not at all, and this seems to be even more important. When it is given, every effort should be made to prepare the patient for and tide him over the crisis which is bound to follow, and if he can live through this he

stands a better chance of complete and rapid recovery than the patient who has had no quinine. The cases for quinine treatment should be very carefully selected, and the question carefully considered whether their resistance, or what is left of it, is strong enough to stand the quinine crisis. To weak or debilitated patients, or to those who are seen late, quinine is only a weapon with which to cut their own throats; or such is Long's opinion, and he is not alone in the belief.

By far the best method of treatment is eliminative. If we will remove the poisonous products of the struggle by means of diuresis, purgation, and diaphoresis, of importance in the order named, nature will destroy the invaders and leave the patient enough blood elements to meet his immediate needs and preserve life in a good percentage of cases. The byword of the older practitioners, "keep his kidneys going and he will live," holds just as good to-day as it ever has, and in nearly all cases in which the urinary flow can be sufficiently maintained a recovery can be at least looked for. Of course, this is not meant to refer to intercurrent conditions and complications to which the hemoglobinuric fever patient and convalescent is exceedingly prone.

THE CONSERVATIVE TREATMENT OF TOXEMIA OF PREGNANCY WITH CONVULSIONS.

GREEN, in the *Boston Medical and Surgical Journal* of March 13, 1913, says that for some time it has seemed to the writer that in this important surgical age there is a too prevalent tendency, in the presence of the gravest obstetrical emergency generally known as, but inadvisedly named, eclampsia, to proceed too hastily to forced delivery, whether the convulsions first occur before or during labor. Since it is now generally accepted that the ovum or fetus is the source of the toxins, the effects of which so often culminate in convulsions before, during, or after delivery, and since the death of the fetus *in utero* often is followed by an abatement of the convulsive seizures, it would seem logical to proceed to empty the uterus as the first step in the treatment. But whether the toxins are of fetal origin or whether they are the product of imperfect maternal metabolism and non-elimination of waste products, the fact remains that the toxemic woman is ill-prepared to resist the shock and trauma of any surgical procedure. Except in the presence of grave surgical emergency, such as fulminating appendicitis or serious bodily injury, no surgeon would operate on a patient with alcoholic toxemia, nor does the internist look to see the chronic alcoholic survive the supervening toxins of grave general infection, such as pneumonia. Save in exceptional cases, therefore, it would seem more logical to postpone active surgical treatment for a reasonable time, until by active eliminative measures the gravid toxemic is better prepared to withstand the added strain of delivery; and the writer believes that when the shock and trauma of the accouchement forcé are hastily imposed upon a nervous system already reacting to toxemic irritation, the *coup de grace* is not infrequently given to women who under more conservative treatment might recover. Moreover, under successfully applied eliminative therapeusis, the cervix and lower uterine segment often soften and expand to a degree that the woman speedily delivers herself under the usually exaggerated uterine contractions of the convulsive attack, or sufficiently to permit delivery without undue shock or injury. After the cervix is softened and somewhat dilated, it is not difficult to procure by digital methods a sufficient expansion for the delivery of the small, non-viable fetus, making use of embryotomy, if necessary; and when the fetus is developed to a viable age, and is alive, the use of a suitable hydrostatic rubber bag very generally results in a dilatation sufficient to permit safe delivery by forceps or podalic version.

Whatever the obstetric treatment may be, the fetal mortality is high, even 50 per cent. In forty cases, recently quoted by Hirst, in which abdominal Cæsarian section was performed for maternal toxemic convulsions,

there were 18 fetal deaths; and yet this method of delivery would seem to afford the best fetal prognosis. The fact is, of course, that the fetus very generally participates in the maternal toxemia, and even if viable, as it often is not, and delivered alive, it frequently succumbs for that reason, and even exhibits typical toxemic convulsions. Moreover, as is well known, the premature baby does not well endure the strain of operative delivery, and even after instrumental cervical dilatation or vaginal Cæsarian section, delivery must be effected by operative procedure. Under these circumstances it would seem that in deciding on the line of treatment to be pursued in a given case, that which affords the best prognosis for the mother should be chosen, since that which is best for the mother is generally best for the child. An exception might be made in the case of the late primigravida, nearly at term with living baby, but with undistensible cervix and vaginal tract; in such a case, in which great parental desire may justify the possibly increased maternal risk, abdominal Cæsarian section undoubtedly affords a better prognosis for the baby than strenuous delivery by the genital tract; but the safely delivered Cæsarian baby may subsequently succumb to its toxemic condition.

If in reasonable time the patient fails to respond to eliminative treatment and to other medical measures for the control of convulsions and the reduction of blood-pressure, if there is deep coma, cyanosis, and pulmonary edema, resort in desperation is naturally had to emptying the uterus, by forced cervical dilatation or by vaginal Cæsarian section; in such cases, however, whatever the treatment, there is usually a lethal termination. But it has seemed to the writer that in many cases eliminative treatment fails because it is not sufficiently vigorous and persevering, and perhaps because it requires a much more exacting and protracted personal attention of the physician than does the rapid evacuation of the uterus.

The method of treatment employed by the writer is essentially as follows: First of all is given a high compound enema consisting of

> Oil of turpentine, 1 drachm;
> Extract of aloes, 20 grains;
> The white of an egg;
> Sulphate of magnesium,
> Glycerin,
> Water, of each 2 ounces.

Next, the patient is given, when feasible, and it is generally feasible in hospitals, a hot-water immersion bath. Immersion need not generally to be continued for more than a few minutes before perspiration appears on the forehead. If the patient is visibly dirty, or if sweating does not soon occur, the use of a flesh brush will promote the activity of the skin. If the pulse is weak, a stimulant is indicated before the bath. The woman is then rolled in a blanket, placed in a warmed bed, laid on a rubber blanket covered with a sheet, and another rubber blanket is spread over the extra blankets which cover her. It is well to remember that this treatment not infrequently serves to induce labor; but in the presence of convulsions the invasion of labor is not available, and the hot, wet pack is made use of; dry heat is much favored by some clinicians. An ice-bag is applied to the head. If the patient is comatose, the stomach is washed out and there is left therein a moderate amount of water, perhaps 8 ounces, containing two ounces of Epsom salts or a like amount of castor oil, with two drops of croton oil; if conscious, the patient can swallow the cathartic. In the presence of marked edema it is not well to give much water at first; otherwise the conscious patient should be caused to drink freely, and bitartrate or acetate of potassium may be given to neutralize acidosis. Fluid in the form of salt solution should be given to the unconscious patient, one or two pints under the breasts, in the face of free diaphoresis and purgation; by this intake and outgo of liquids the blood may be effectively washed of its toxins. Nitroglycerin in 1/100-grain doses is sometimes valuable to relieve blood tension and promote diaphoresis; but generally the blood tension is sufficiently reduced by the active

function of skin and bowels. Veratrum viride is much approved by some authorities, but that drug and pilocarpine have both been discarded by the writer. To control convulsions and nervous restlessness, morphine is used. In the event of a living, viable fetus, and in order not to inhibit uterine contractions, it is used in moderate doses, generally not more than 1/4 grain, with subsequent 1/6-grain doses at two-hour intervals, or 1/4-grain doses according to indications and results.

Meanwhile watch is kept for the invasion of labor, which quite generally supervenes. If labor is not excited by the eliminative treatment, and the toxemia and convulsions abate, pregnancy is allowed to continue, especially when the fetus is alive and not yet viable; if the fetus is dead the woman is generally allowed to await spontaneous delivery. In chronic nephritis, however, labor is quite generally induced not later than the end of the eighth month. When under eliminative treatment labor begins, as soon as the cervix is softened, effaced, and a little dilated, hydrostatic bags are used and the labor terminates unaided, or more generally is completed with forceps or version and extraction. After delivery, eliminative treatment is continued until convulsions cease and edema disappears. Sometimes there is free postpartum bleeding, and in the presence of a persisting high blood-pressure this is regarded as a beneficent phenomenon. Reference has already been made to what must be regarded as rational treatment of severe toxemic convulsions when the usually successful eliminative and sedative measures fail.

It is generally recognized that neither ether nor chloroform is a good anesthetic for use in the obstetric surgery of the toxemic parturient in convulsions, on account of the pulmonary and renal irritation of the former, and of the hepatic irritation of the latter; some authorities on this account recommend nitrous oxide gas. With this anesthetic agent in the conditions under consideration, the writer has had insufficient experience to judge of its merits; but for the last four years he has used anæsthol, consisting of ether 46 parts, chloroform 37 parts, and ethyl chloride 17 parts, and has been well satisfied with its effects.

THE RATIONALE OF THE USE OF ADRENALIN IN THE TREATMENT OF ASTHMA.

McCord in the *Medical Record* for March 8, 1913, writes on this topic. In the abstracts made by McCord no attempt is made to cover the entire literature, but rather to cite the experimental basis for adrenalin treatment and attempt to correlate clinical results, explained at present by means of far-fetched theories. That adrenalin has found so scant favor at the hands of the general practitioner may be ascribed to the fear of evil secondary effects. Braun warns against the subcutaneous injection of adrenalin, but wide-spread and extensive clinical experience not only does not bear this out, but indicates that such a fear is groundless. Kirchheim injected daily 12 Cc. of the market solution for many weeks into patients with severe infectious diseases. No secondary effects of evil nature were to be noticed. At the time of injection certain unpleasant results have been pointed out as occurring transiently. Severe palpitation of the heart may occur, which leads to a very pronounced, but not accelerated, pulse. A peculiar restlessness may set in which may create the patient's alarm, and at times the face may rapidly become very pale, but all of these pass rapidly away, and at the same time the respiration becomes easier and softer and the rattling and wheezing sounds cease.

From the results indicated above growing out of the use of adrenalin by both laboratory and clinical workers it seems reasonable to conclude:

1. Adrenalin extends the lumina of contracted bronchioles.

2. This dilatation of the bronchioles is probably the basis for the beneficial action of adrenalin in the treatment of asthma.

3. The dilatation follows subcutaneous,

intravenous, and endobronchial administration.

4. The action is transient but very effective in relieving the acute attack. The subcutaneous administration apparently is the most transient.

5. The administration is simple and no injurious results follow as a secondary sequence.

URTICARIA TREATED WITH ADRENALIN.

SWANN in the *American Journal of the Medical Sciences* for March, 1913, says that from the results obtained in six cases of urticaria it seems probable that in such cases the vessels in the wheals are in a state of optimal tonus for the action of adrenalin, and that on them the drug has an unusual and selective effect. In contrast to asthma, however, the rise of blood-pressure which occurred was in most cases greater than usually follows subcutaneous injections of adrenalin in other types of disease, or in health, and may have been due to a generally relaxed condition of the arterial tree, which one would expect to be present in such cases. A relationship between the rise in pressure and the subsidence of the eruption is shown by a chart, where it is readily seen that in every instance except one the wheals began to fade soon after a marked rise in pressure had occurred, and continued to fade while the pressure was rising or still above normal. On the other hand, the inconstancy of this relationship is shown in one case, in which the rash nearly disappeared before any rise of blood-pressure took place, and by the fact that in most of the cases the wheals did not reappear for some time after the pressure had again fallen to its starting-point. It is therefore by no means certain whether the disappearance of the rash depends entirely upon the local contraction of the blood-vessels or whether it also depends upon some other process. Meltzer and Auer have shown by animal experimentation that adrenalin retards absorption from the tissues into the blood and transudation from the blood into the tissues, and that this effect is maintained well after the blood-pressure has fallen to normal. It is possible that this may be instrumental in causing the wheals to disappear, though it would seem more logically to be a factor in preventing their reappearance.

The effect produced in these cases of urticaria suggests that adrenalin might be used to advantage in certain more serious yet similar conditions. One such condition is "angioneurotic edema" in its various forms. At the present time, except for general hygienic management, little can be done for these cases, and it will be interesting to see what can be accomplished with repeated doses of epinephrin. In cases of edema of the epiglottis or larynx due to disturbance of this type adrenalin given intravenously, if its action were similar to what it has been in these cases of urticaria, might well be the means of saving life, when the local application of the drug and other measures had failed.

Another such condition is anaphylaxis, with severe bronchial spasm and edema. From its physiological action on the bronchial and peripheral vessels, adrenalin should theoretically be the most specific of any drug in these cases. That it may relieve the asthma of anaphylaxis, at least temporarily, is well known to clinicians, and its effect on certain urticarias of this type has been shown in this paper. Whether or not it could be made beneficial in every case if the doses were properly manipulated is a question of some interest. Swann states he knows of one extreme case of anaphylaxis with dyspnea, but without edema, in which adrenalin had no apparent effect, though it is impossible to say what larger and more frequent doses might have done. We know too little, however, of the possible reactions which may in turn follow the primary dilatation produced by the adrenalin to give more than moderate doses in such grave cases, and this point requires further investigation.

The rapidity with which the erythema has faded in Swann's cases suggests the possibility of using adrenalin to differentiate rashes of purely vasomotor origin

from those of other types. Hayes suggested its use in diagnosticating serum erythema from the rash of scarlet fever. Swann has not yet had an opportunity of trying it in a case of scarlet fever, but it is rational to expect that the scarlet rash would fade but little or not at all.

THE USE OF ANTISTREPTOCOCCUS SERUM LOCALLY IN THE TREATMENT OF VACCINAL ULCERS.

In the *Archives of Pediatrics* for February, 1913, SEXTON says he feels sure the profession will welcome any form of treatment that will shorten the duration of and lessen the number of infected vaccinal ulcers.

We do not have to look far into the past to see whole provinces practically depopulated by the scourge of smallpox.

With the advent of vaccination we note a sudden and continuous decrease in the number of epidemics and the percentage mortality, until to-day smallpox epidemics are practically a thing of the past.

This condition can only be accounted for in one way, viz., through the influence of vaccination.

They have vaccinated in the Willard Parker Hospitals, during the past four years, 45,735 persons. Naturally out of this vast number they have had many infections, due in every instance, apparently, to the introduction into the wound of some extraneous microörganisms which produced the tissue necrosis.

There is no condition which offers greater resistance to ordinary treatment than vaccinal ulcers, and it was with a view to lessening the number and persistence of these that they began the use of serums locally some three and one-half years ago. From the first use of antistreptococcus serum they noted a marked improvement in these indolent, punched-out vaccinal ulcers, and Sexton asserts he has yet to see one that has not responded readily to the constant application of antistreptococcus serum used locally in the form of a wet dressing.

The wound is filled with the serum; this is covered with a small wet dressing of same, and over this is placed an oiled silk dressing in order to maintain the moisture as long as possible. The dressings when dry become very hard and stiff. In order to obviate the unpleasantness caused by this they remove the oiled silk and remoisten the dressing, without disturbing it, three or four times daily.

The rapidity with which these indolent ulcers respond to this form of treatment is remarkable.

They have tried various other serums, including normal horse serum, but the results from their use have not been satisfactory.

THE EFFECT OF PITUITRIN UPON THE GRAVID UTERUS.

FABRE and RHENTER (*Bulletin de la Société d'Obstétrique et de Gynécologie de Paris,* February, 1913) report a series of observations on 17 cases in which pituitrin was administered to primiparæ and multiparæ ranging in age from eighteen to forty years. Their results point to the efficacy of its use without regard to the age of the subjects or to the degree of parity. It is indicated in uterine inertia, partial or complete, and repeating the statement made by them a few months ago, they emphasize that this is the only indication for the medication. The position of the child will of course always require the use of forceps in certain conditions, as occurred in two of their cases. The procedure is positively contraindicated where there is genuine disproportion between the head and the width of the pelvis. Although in one case a child of 3430 grammes passed through a narrow pelvis, the disproportion seemed to be a slight one, and the injection of pituitrin given one day provoked contractions which fixed the head, and it was then engaged the following day, when two more injections were administered. There is no doubt that the violent muscular effort of the uterus to overcome great pelvic obstruction is apt to lead to accidents and the risk of rupture.

In the first 15 cases pituitrin was ad-

ministered in the presence of more or less pronounced uterine inertia, either during dilatation or during expulsion, with the following results: In spite of the administration of pituitrin forceps had to be applied in three cases: on account of the absence of a right posterior rotation in one case, and in the other two the nature of the contractions necessitated a Kristeller maneuver.

Exclusive of the three forceps cases labor was terminated 62 hours after injection in one case, 48 hours in one case, 8½ hours in one case, 4 hours in one case, and less than 3 hours in one case.

In nine instances dilatation, not present at the time pituitrin was injected, followed in 61 hours. In one case the first injection was ineffectual, but three hours after a second injection on the next day the cervix was dilated 2 cm. In the other cases seven hours was required in one instance to produce a centimeter expansion, and four hours for ½ cm. in another. Two hours or less in the other cases saw a dilatation of 1 to 5 cm.

In 12 of the 15 cases the contractions were regular and strong. In one instance they were not sufficient to produce rotation; in another a Kristeller maneuver was required; and in a third, while the contractions provoked by pituitrin were sufficient, the desire to hasten the accouchement necessitated a Kristeller maneuver, so that exact results could not be obtained. The contractions usually appear promptly, ten minutes or less after injection, and are normal in character and duration. The graphic tracings show tetanic and double and triple movements. Their average duration is one hour, ranging from two hours to forty minutes.

The results of the experiments agree with previous conclusions that the fetus is not affected by the procedure. As for the mother, the vertigo, tachycardia, etc., noticed in some of the earlier cases were not seen in any of this series.

Delivery was always made according to the slow method in use in their clinic. In two cases intrauterine exploration was necessary on account of retention of the cotyledon and the chorion, respectively. In conflict with the results of Siguret, there was no precipitate delivery nor any unusual loss of blood. In the present series delivery took place after waiting 10 hours in one case, 2 to 3 hours in three cases, 1 to 2 hours in six cases, 45 minutes in two cases, and 35 minutes in one case.

In only two cases was delivery effected very quickly, immediately after expulsion, and ten minutes after in the second case.

As to the loss of blood, in none of 10 instances did it amount to much, and only in one of the two did it assume the proportions of a hemorrhage (700 grammes).

It may thus be concluded that pituitrin accouchement was satisfactory in the entire series, for in only three were contractions provoked without any result.

While we are still obliged to reserve judgment in regard to the röle of an *agent provocateur* in uterine contraction, its action in hastening arrested or retarded labor is indisputable. Those rare cases which are apparently unaffected by the medication are probably due to some peculiar disturbance of uterine contractility, and to insufficient dosage, as is shown in one case in which a second dose failed to provoke any better contractions than the first.

PITUITRIN FOR UTERINE INERTIA.

WILETTE (*Bulletin de la Société d'Obstétrique et de Gynécologie de Paris,* February, 1913) reports two cases in which weak and insufficient uterine contractions were so stimulated after an injection of pituitrin that they became regular and strong after twenty minutes. Accouchement was accomplished in two hours in the one instance and in three hours in the other, without any untoward accident, either during the labor, during the delivery, or during the subsequent child-bed period. Without wishing to deduce conclusions from so limited an experience, he nevertheless deems it worth while to report these observations as a contribution to the study of a procedure still novel.

PITUITRIN IN URINARY RETENTION.

EBERLE (*Zeitschr. f. Gynäkologische Urologie,* 1913, No. 2) reports good results from the use of pituitrin in severe mechanical injury to the bladder during child-birth. He has abandoned its use where severe injury to the bladder itself exists, because the drug is effectual only when the bladder is full, and a distended bladder interferes with the healing process.

It is well known that besides its influence on the muscles and the nerves of the bladder pituitrin also possesses a diuretic action. Experiments have shown that an intramuscular injection of pituitrin will effect evacuation of a full bladder, the time relation being in inverse ratio to the fulness of the organ.

In view of the fact, in which all authors concur, of the prompt action of pituitrin on the uterus in parturition on the one hand, and, on the other, considering that the uterus and the bladder are supplied by the same nerves, it is strange that the therapeutic effect of the medication on the bladder is not seen until some time after injection —usually not until the bladder has reached its maximal fulness. It appears that the particular component of pituitrin which excites muscular contractility is not always capable of acting independently, and that it requires a secondary factor, which is its diuretic influence.

We all know the muscular stimulation induced by the injection of a small quantity of a fluid in retention of urine. The action of pituitrin in filling the bladder is analogous to this, and the secondary distention of the bladder-wall in no small degree stimulates its now sensitive nerves, which in turn induce the organ to extrude its contents.

Thus it may be said that *pituitrin, if administered when the bladder is full, is an excellent means of combating retention of urine.*

After completing this article the author was made aware of the publications of von Jaschke (*Münch. med. Wochenschr.,* 1912, Nr. 30) and R. Franz (*Mittheilungen des Vereins der Aerzte in Steiermark,* 1912, Nr. 4). While the latter had good results in inducing urination in only three out of twelve patients, v. Jaschke was successful in four-fifths of 44 cases in producing bladder function by pituitrin injection.

THE ANTIARTHRALGIC AND ANTINEURALGIC ACTION OF ADRENALIN.

DR. FELIX GAISBÖCK, of Innsbruck, discusses (*Medizinische Klinik,* 1913, No. 11) the antiarthralgic and antineuralgic effects of adrenalin. His observations comprise a series of 15 cases, in 14 of which the onset was acute, and in most of which the use of adrenalin in doses of 5 to 10 drops of the 1-to-1000 solution hypodermically did good.

Four cases of polyarthritis proceeded without complications. Icteric scleræ and increased urobilin secretion were noticed in two cases with subsequent development of fibrinous pericarditis, and pleural effusion occurred during the course of the disease in two other cases. A striking feature of one case was the appearance of polyarthritis with an unusually marked inflammation of the elbow-joint after lues and its treatment by inunction. In another case, a boy of sixteen years, acute monarthritis formed part of the syndrome of an osteomalacia of the ends of the femur.

Two cases that remained uninfluenced by adrenalin were probably of some other origin (sepsis?). Also unaffected by the medication was a case of arthritis deformans, and the same is true of inflammatory diseases of the nerves. Two sciatica patients, aged fifty-three and sixty-three years respectively, showed decided improvement, especially the younger of the two. The ages of the patients were: 7 below thirty years, 7 below fifty years, 2 above fifty years (the two sciatica cases).

No prolonged, unexpected complications were noticed in any of the series. Neither was there any clinical indication of an increased coagulation time of the blood, Velden to the contrary notwithstanding.

In conclusion it may be said that in adrenalin we have a favorable organothera-

peutic agent in inflammatory arthritis, more or less dependent on the etiology of the latter, as well as in neuralgic conditions.

Adrenalin thus takes rank also as an antineuralgic, opening up an entirely new field of indication for the use of the drug, interesting alike to the practitioner and the theorist. Its "asthmatropin" action suggests another similar relationship. Like adrenalin, pyramidon frequently will promptly check a case of bronchial asthma. Their mutual characteristic seems to consist in their influence in correcting local circulatory disturbances (Schmidt); to this also may be attributed the favorable action of adrenalin in osteomalacia, bronchial asthma, and arthritis.

LUMBAR PUNCTURE, AN AID TO DIAGNOSIS: ITS VALUE IN RELIEVING CONVULSIONS.

FISCHER in the *Archives of Pediatrics* for February, 1913, says that the frequency of convulsions in children prompts him to call attention to the necessity of a lumbar puncture as an aid to an early diagnosis of this very important symptom.

Intestinal intoxication is a frequent cause of cerebral congestion, resulting in convulsions. But more commonly convulsions are the initial symptoms of an infectious disease, a forerunner of pneumonia, occasionally an early manifestation of scarlet fever, measles, or diphtheria. One must not overlook the frequency of convulsions in the beginning of a cerebrospinal meningitis, a tuberculous meningitis, or some malignant form of cerebral manifestation. The diagnosis is therefore important, and the sooner we locate the origin the more easily will we be able to lend therapeutic aid. Convulsions recur, and because of their recurrence we can try to control their frequency or prevent their return. This can be accomplished by reducing intracranial pressure. For this purpose lumbar puncture is indicated.

Method of Making Lumbar Puncture.—The subarachnoid space is frequently tapped for diagnosis and therapeutic purposes. Either the space between the third and the fourth or the fourth and the fifth lumbar vertebræ may be chosen. The child is placed on either side with the spinal curve toward the operator, in this way spreading the vertebræ. An imaginary line drawn through the crest of the ilium to the spine is an easy means of locating the place to puncture.

Kind of Needle Required.—In making a lumbar puncture we should use such a needle as would be required in making a puncture aspiration in empyema. The needle should be pushed a little upward and forward until it enters the spinal canal, then the stylet should be withdrawn. If the fluid does not escape through the needle, then withdraw it slightly and reintroduce the stylet to dislodge any obstruction in the lumen of the needle. Make the puncture as simple as possible rather than lacerate the tissue around the vertebral column and cause bleeding by lateral movements of the needle.

Amount of Fluid to be Withdrawn.—For diagnostic purposes 15 to 20 Cc. should be withdrawn if the fluid is watery and clear. If the spinal fluid is turbid, then the more we can withdraw the better. Fischer has withdrawn as much as 50 to 60 Cc. at one time.

The site of puncture should be closed with a strip of adhesive plaster, or with a drop of collodion.

Local Anesthesia.—Ethyl chloride in the form of a spray is useful in very sensitive children. It is not necessary to have general anesthesia during this procedure. General rules of asepsis must be strictly applied to the child's skin, the operator's hands, and to the needle used.

Dry Tap in Lumbar Puncture.—We may have a dry tap:

First, if the caliber of the needle is small, and the spinal fluid very thick.

Second, if adhesions are present at the base of the brain, preventing the passage of fluid from the ventricles to the subarachnoid space.

Third, if a successful puncture has been made a dry tap may follow, due to inflam-

matory adhesion caused by the previous introduction of the needle.

Fourth, the closing of the foramen of Magendie is the most frequent result of the inflammatory process, resulting in dry tap.

Fifth, a fibrin clot, or the presence of the cord in front of the needle, may prevent the outflow of the cerebrospinal fluid.

To be sure that we are in the spinal canal if a dry tap results, leave the needle *in situ* and introduce a second needle two spaces lower. Sterile water if injected through the upper needle will flow out of the lower needle, proving that we are in the spinal canal.

The spinal cord in infants terminates about the level of the lumbar vertebræ. The introduction of the needle is simplest between the third and fourth or the fourth and fifth lumbar vertebræ. In these interspaces there is no cord, hence no injury can follow.

The points to note are: The turbidity or clearness of the spinal fluid, and whether the fluid was tapped under great or no pressure.

We must not be satisfied with a macroscopic examination, but must depend on the microscopic findings. Apparently clear fluid may be present in the early stage of cerebrospinal meningitis, and by centrifuging the fluid the diplococcus intracellularis may be found. In like manner careful search will frequently show the presence of the tubercle bacillus in the early stages of tuberculous meningitis.

This simple remedy is a rapid means of controlling convulsions, and is far more efficacious than the use of chloroform anesthesia.

Next in importance is to relieve the intracranial pressure by lumbar puncture; an injection of a pint of soap-water should be given to empty the rectum. If the child can swallow, give 2 grains of calomel, followed by teaspoonful doses of rhubarb-soda, in all about six doses. This eliminative treatment should be given before any nutrition is ordered. Large quantities of water may be given. An ice-bag should be ordered to be applied over the anterior fontanel. It is important not to move a child too much during a convulsion, for handling the limbs will frequently provoke a spasm.

LARGE DOSES OF ANTITOXIN GIVEN EARLY A MEANS OF PREVENTING LARYNGEAL STENOSIS.

FISCHER in the *Medical Record* of February 22, 1913, reports four typhoid cases, and says that from a study of these cases it is evident that effectual treatment consists in giving a large injection of antitoxin at the beginning of the treatment. In a severe case 10,000 to 20,000 units should be injected at the beginning; whether or no more antitoxin should be injected must depend on the result of the first injection. In all of the cases reported the first injection appeared insufficient, and it does seem that the additional doses help to modify the toxemia. Park maintains that one injection given at the beginning, be it 5000 or 10,000, is sufficient; he maintains that antitoxin can be found in the blood many days after such injection, and since antitoxin can be found in the blood he insists that no more should be injected.

Fischer's rule in intubation and extubation has been: (1) Avoid force; thereby avoid injury. This rule has been his greatest aid in preventing retained tubes. (2) Do not hurry. While in a severe laryngeal stenosis a given amount of haste is necessary in selecting the proper sized tube and making preparations, yet when it comes to the introduction of the tube the inflammatory process and subnormal condition must be remembered; hence one should go slowly. The nervous and frightened child must be quieted, especially when considering extubation. His rule is to give an antispasmodic for twelve hours preceding the removal of the tube. Codeine, one-eighth to one-fourth of a grain, to a child two years old or over, repeated in three hours for four doses, or ten-grain doses of sodium bromide with two grains of chloral hydrate, repeated in six hours (two doses only), will allay nervous excitability and have a quieting effect. The antispasmodic should

be continued for twenty-four hours after the removal of the tube. The spasm due to fear of the operating table when repeated intubation and extubation are practiced may in rare cases require an inhalation of a few drops of ethyl chloride prior to extubation. Dover's powder is a valuable drug as an antispasmodic prior to extubation. Intralaryngeal medication consists in applying a coating of medicated gelatin to each tube. Such medication as orthoform, 10 per cent in gelatin or ichthyol-gelatin, served Fischer well in a case of persistent tube, reported seven years ago. Owing to the thickness of the coating of gelatin a tube one size smaller than usual is required.

Subcutaneous Method.—In severe cases of diphtheria it is better to give 10,000 units by hypodermic means. As a rule some benefit should be noted within twelve hours after such treatment.

Intravenous Method.—If septic manifestations are evident, especially if the case has been untreated for many days, the most rapid method of destroying the diphtheric poison is by injecting into the median basilic vein at least 10,000 to 20,000 units.

ADRENALIN IN THE EMERGENCY TREATMENT OF NON-CORROSIVE POISONING BY THE MOUTH.

JONA in the *British Medical Journal* of February 8, 1913, writes on this topic. As to cyanides, he says the hitherto generally recognized antidote in cases of cyanide poisoning has been that advocated by Professor C. J. Martin and Mr. J. A. O'Brien. Its principle is the formation in the gastrointestine of Prussian blue, which is a practically innocuous substance, by the administration subsequent to the cyanide poisoning of ferrous sulphate and alkali. They proposed that 33 Cc. (1 ounce) of ferrous sulphate solution of 23-per-cent strength, 30 Cc. (1 ounce) of KOH (5-per-cent solution), and 2 grammes (30 grains) of magnesia, the former two kept in hermetically sealed vials, be mixed and immediately taken. In their experiments on rabbits, using a lethal dose of 0.01 gramme, given as 10 Cc. of a 0.1-per-cent solution of KCN per kilogramme of body weight, they found that death invariably ensued unless the antidote were administered within five minutes. Considering that the antidote consists of three separate ingredients, which must be mixed before use, the preparation of the antidote must occupy time and would probably take about two minutes, even if everything were at hand; so that if about three minutes were lost before discovering that cyanide had been accidentally taken, the patient's chances of recovery would be very small, for we may legitimately assume that the respite or "latent period" would only be a little if any longer in the human being than in the rabbit. Also, the ordinary medical man might not have the antidote ready at hand, and the value of some means of delaying the absorption of the poison from the gastrointestine is apparent, and this is especially so in the case of poisoning by cyanide, whose action is so rapid.

Intraperitoneal injections of adrenalin having been found to diminish the rate of absorption of strychnine introduced into the stomach, it was therefore decided to try and see if adrenalin administered by the mouth would have any effect in giving more time to treat a case of cyanide poisoning. As a preliminary investigation, KCN solution, of strength varying from 1 to 5 per cent, was painted on various mucous membranes (conjunctiva, buccal mucous membrane, gastric mucosa) for five minutes, and then adrenalin (1 to 10,000) painted on, when blanching occurred in every case.

These experiments showed that adrenalin will still exert its vasoconstrictor action even after the arteriolar wall has been subjected to cyanide.

Further experiments showed that when adrenalin solution was administered (about 4 to 5 Cc. 1-in-10,000 solution per kilogramme body weight, the rabbit receiving the lethal dose of 0.01 gramme KCN per kilogramme body weight) either with or subsequently to the administration of the poison the animal's life was prolonged, and if the adrenalin solution were administered

within five minutes of the poison, and Martin and O'Brien's antidote given, or the stomach washed out within four or five minutes subsequent to the administration of the adrenalin, the animal's life would be saved. Thus, the administration of adrenalin "on sight" would give a respite of some minutes during which the antidote could easily be prepared and administered or the stomach contents evacuated.

The results of a few of the more crucial experiments are appended. A number of experiments have been discarded because the rabbits did not tolerate the washing out of the stomach to which many were subjected. It may also be stated at the outset that Martin and O'Brien found that if a dose of cyanide were going to prove fatal the rabbit always died within thirty minutes, so that we may take it that if we are able to tide a patient over the fatal thirty-minute limit by any means at our disposal, then the patient will have a very fair chance of recovery. Of course, if it be borne in mind that the adrenalin only delays the absorption of the poison (principally by its vasoconstrictor action on the vessels of the mucosa) it will be recognized (as shown in one experiment) that those cases are practically hopeless in which a large dose of the poison has been taken, and in which the amount of poison being absorbed through the mucosa even under maximal adrenalin influence exceeds the lethal limit, unless the chemical antidote be immediately given or the stomach immediately evacuated. The time relation here indicated (namely, that the pathological effect depends to a certain degree upon the amount of poison coming into contact with the tissues per unit of time), and the fact that the administration of an amount of KCN below a certain limit is accompanied by very little, if any, evident effect on the animal, seems to suggest that we have in the case of the action of chemical substances on all tissues of the body a parallelism to the action of various strengths of stimuli acting on a motor nerve and effecting the muscular response in the presence of a lumen or threshold, an optimum and maximal strengths of stimulation. Further research, however, is required to determine this.

Further experiments showed that the administration of doses of adrenalin far in excess of those recommended by the cited experiments left, as far as the eye could detect, no lasting effects on the animals. The general results obtained from rabbits were:

The animal (receiving a lethal dose of 0.01 gramme KCN per kilogramme body weight) will recover if—

1. Adrenalin (3 Cc. 1-in-10,000 solution) be administered within five minutes of the poison.

2. Martin and O'Brien's antidote be given or the stomach washed out within about four minutes of the administration of the adrenalin.

3. A further small dose of adrenalin be given.

The area of a rabbit's stomach was found to be 95 sq. cm. That of a man is given as about 3000 sq. cm. Therefore, the dose of adrenalin which a man should take on this basis of, say, 3 Cc. of 1-in-10,000 per 100 sq. cm. stomach area would be about 90 Cc.—that is, 9 Cc. (3 drachms) of the 1-in-10,000 solution), followed afterward by about 5 Cc. (1½ drachms) of the 1-in-1000 solution, diluted (that is, 50 Cc., or nearly two ounces of 1-in-10,000 solution).

The experiments seem to show that in a case of cyanide poisoning the following procedure is advisable:

1. Adrenalin be immediately given.

2. Then Martin's antidote if it be at hand.

3. Then wash the stomach out; and

4. After having washed the stomach out, administer some more adrenalin.

The object of the latter is to "follow up" any cyanide which has escaped the washing-out process or Martin and O'Brien's antidote, and so retard its absorption, for Martin and O'Brien found that if death did not ensue within thirty minutes of administering the cyanide, the animal would live. It might also be advisable to give a brisk saline purge soon afterwards.

Should Martin's antidote not be at hand, the order of procedure should be 1, 3, 4, as above.

There are two further considerations which must be taken into account before the recommendations made above are to receive acceptance. First, is the adrenalin affected by the HCl of gastric juice or by the pepsin? This question has been answered by Oliver and Schäfer, who showed that gastric digestion (by pepsin—HCl) for twenty-four hours does not seem to lessen the physiological properties of extract of suprarenal gland. Secondly, how long will the adrenalin introduced into the alimentary canal continue to act on the lining membrane? The results obtained by Oliver furnish the desired information. To quote from his paper: "Suprarenal extract invariably produced the most decisive contraction, and one, moreover, which persisted for thirty to sixty minutes. The constriction was equally pronounced whether the spinal cord remained intact or was destroyed. The velocity of the circulation was likewise lessened, and at the acme of the constriction the onward flow might cease." Oliver's recommendation that these might be verified on the inflamed conjunctiva of a rabbit has been confirmed. It was also found that on administering adrenalin solution to a rabbit with a *full* stomach, there was a constricting action not only on the vessels of the gastric mucosa, but also on the vessels of the mucosa some inches down the small intestine, which lasted for quite fifteen minutes.

In the case of strychnine and aconite, too, a number of experiments were performed, and the efficiency of adrenalin in delaying absorption conclusively proved. With these poisons the administration of adrenalin until the stomach can be thoroughly emptied is indicated, and in them the stomach *must* be emptied and the poison got rid of, otherwise the poison will be absorbed and exert its action on the body when the action of the adrenalin on the stomach has ceased, as shown by one of the experiments.

Experiments were also tried with other rapidly-acting poisons, such as potassium binoxalate (neutral), but the gastric mucosa was found (post-mortem) corroded, and free blood was found in the stomach, so that disturbing factors due to erosion and not remediable by adrenalin were present.

USES OF APOMORPHINE.

EPTING in the *Charlotte Medical Journal* for February, 1913, says that in any case, where relaxation is wanted, one can use apomorphine with quick and good results. It is useful in croup, asthma, hysteria, hysteroepilepsy, eclampsia, tetanus—and convulsions, even from strychnine poisoning. In eclampsia, where large enough doses of morphine are contraindicated, one can relax patient, control convulsion, and produce elimination through the skin (thus relieving the kidneys) by the use of 1/20 grain apomorphine and 1/12 grain morphine.

Apomorphine is especially valuable in all hysterical cases in which the patients are rigid, for it will not only give relief then, but will help to cure them.

For delirium tremens, or even a big drunk, apomorphine with a small dose of morphine and atropine, and, if needed, a small dose of a heart stimulant, will sober him in a short time.

For some patients, morphine alone does not have the desired hypnotic effect, and for some it causes nausea; if 1/40 grain of apomorphine be added to the morphine given such cases, the desired hypnotic effect will be produced quickly without the nausea following.

The mode of administration is very important.

As an emetic, always give apomorphine hypodermically. The stomach should be first filled with warm water before the injection is given, as this aids the apomorphine in emptying the stomach and makes vomiting easier. In cases of this kind (except opium poisoning), when Epting administers emetic doses of apomorphine he always combines a small dose of morphine and atropine, and if the heart is weak,

strychnine also. When thus given the nausea will be over soon, and rest and sleep quicker.

As an expectorant, give frequent small doses by the mouth.

For pain, where the nervous tension is great, and morphine is administered, quicker relief can be gotten with less of the bad after-effect of morphine if 1/30 grain of apomorphine is added. In hepatic or kidney colic relaxation is especially needed; it can be gotten with apomorphine added to the morphine. There is also less danger of the patient forming the "morphine habit" when this combination is administered.

In summarizing, Epting states he gives frequent small doses of 1/30 grain by the mouth, until effect is produced, when used as an expectorant.

As an emetic, the dose is 1/20 grain apomorphine, 1/12 grain morphine, and 1/300 grain atropine.

Always give several glasses of warm salt water, with the suggestion that the water will cause vomiting.

Reasonable care should be taken in administering to very weak patients, to the aged and to young children.

INDICATIONS AND TECHNIQUE IN GASTRIC RESECTION AND GASTROENTEROSTOMY.

CRILE (*American Journal of Obstetrics and Diseases of Women and Children*, February, 1913) discusses in his paper the following points:

In what type of gastric and of duodenal ulcers shall resection be made? In what type shall gastroenterostomy be made, and in what type jejunostomy? What type of management gives the best results in cases handicapped by hemorrhage and starvation? What is the significance of acetonuria? What method of suturing will make the strongest union? Lastly, how can shock be reduced to a minimum?

Discussing the last point first, the combination of nitrous oxide, general anesthesia, novocaine, local anesthesia, and quinine and urea hydrochloride, postoperative anesthesia, combined with ample incision and gentle handling, establishes anociassociation —or shockless operation.

A preliminary transfusion of blood brings back the vitality of patients exsanguinated by hemorrhages and makes them good risks; thus the surgeon may reclaim the bad risks in hemorrhage from ulcer of the stomach or duodenum.

In starvation cases the risk cannot be so successfully reclaimed, though the patient may be much improved by transfusion. The risk in these cases is not shock and depression, but a broken metabolism expressing itself as acidosis.

Since employing transfusion the writer has had an opportunity of seeing more clearly the dangers of acidosis, for he has operated on cases all but moribund and has seen them pass through the operation unchanged, and he has seen metabolic death follow. Heretofore such cases would not have been operated, and if operated would not have survived long enough for study. There is a stage of acidosis rather easily recognizable which proves fatal as a metabolic process in spite of complete control of the blood volume, and measurably of the blood-pressure. This does not in the least apply to acute or chronic hemorrhage. Here transfusion gives an absolute control.

The technique of suturing that will hold even edematous visceral walls is an adaptation of the oldest known stitch, viz., the shoemaker or cobbler stitch. A typical shoemaker's stitch may be introduced throughout the entire wound. The stitch becomes an interrupted continuous stitch by tying the sutures several times on each lap and at the corners. A running peritoneal stitch as a second row completes the suturing. It will be at once apparent that this stitch, piercing as it does every layer, and so utilizing every atom of the strength of the visceral wall, must be the strongest stitch and will not permit either leakage or hemorrhage.

Turning now to the indications in cancer and ulcer Crile proposes the following: In cancer palpable glands may be only inflammatory, if the liver is free; if there is no

local invasion of surrounding tissue, then resection and gastroenterostomy are indicated; if the patient is seriously weakened by starvation, and is still operable, then a two-stage operation is made—first, a gastroenterostomy, and as soon as the metabolic balance is restored, usually in ten days to two weeks, resection is made. In starved cases of ulcer the method of Prof. Von Eiselsberg is followed, viz., making a jejunostomy under local anesthesia, feeding until a safe vital margin is reached, then operation. But Prof. Von Eiselsberg has found that if the jejunal fistula is maintained for from six to nine months gastric ulcer may be cured.

Perhaps the most difficult type of gastric ulcer is that known as saddle ulcer. Gastroenterostomy is of doubtful value; Von Eiselsberg's method, though apparently curative, is tedious and does not protect against subsequent cancer; medical treatment has of course proven futile. In these cases the German surgeon would make a transverse resection, because if a local resection were made the stitch tension would result in leakage. Crile has found the apparent solution to these cases in the use of the cobbler stitch in the following manner:

First, an ample opening is made into the stomach through a healthy portion of the wall, avoiding the larger blood-vessels.

Second, the saddle ulcer is pressed through this opening from behind.

Third, using a "needle at each end" thread, a cobbler stitch is securely inserted.

Fourth, the entire ulcer is now cut away free from the stitch line.

Fifth, the first incision is closed.

Crile does not believe that any suture excepting one of the through-and-through type—especially the cobbler stitch—would hold. He has found this stitch amply strong.

In choosing the type of operation in gastric ulcers, because of the uncertain cure by gastroenterostomy and the probability of cancer, it must be borne in mind that excision is the operation of choice. In duodenal ulcers there is slight probability of cancer sequence, and the ulcer is curable by gastroenterostomy. Cure is perhaps hastened by temporary closure of the pylorus.

In Crile's personal experience, and that of his associates, Dr. Bunts, F.E., and Dr. W. E. Lower, as well as the Lakeside Hospital records, there were notes on 420 operations for gastric and duodenal lesions. Of these 208 were performed for cancer, 204 for benign obstructions and ulcers, and eight for traumatic perforations.

Summarizing his experience, Crile says that all duodenal ulcers are cured; congenital stenosis is cured; acute gastric ulcers in the lesser curvature and the cardia treated by gastroenterostomy are often disappointing, but resection cures; in cancer the cures depend on the status of the lesion; resection of gastric ulcer of the saddle type is not only safe but the results are clinically good.

Transfusion of blood in cases of hemorrhage, the mastery of the cobbler stitch in all parts of the operation, the performance of shockless operations on the principle of anociassociation, have now given an almost complete control over the operative results in gastric surgery.

ONE THOUSAND CASES OF SYPHILIS TREATED WITH SALVARSAN.

Kilroy (*Lancet,* Feb. 1, 1913), basing his announcement upon an experience with a thousand cases in the Royal Naval Hospital, states that 2147 injections were given to 1000 cases—the first injection on August 16, 1911, and the last on November 8, 1912. No deaths have occurred. Seventeen cases received only one injection; 865 cases received two injections; 75, three injections; 40, four injections; and 3, five injections. There were three cases of pain, stiffness, and swelling of the arm, causing some loss of service, but no permanent damage. In one of the cases quite recently he felt confident that he injected 250 Cc. of the solution into the space between the vein and its sheath. The reactions were on the whole very mild—twice a temperature of 104.8° F. The great majority showed no rise of

temperature. A few reactions were delayed to the next day. No reactions occurred on the day of injection. Herxheimer reactions were not very common, and it was difficult to separate them from arsenic rashes. He could not satisfy himself that they were more common in one particular type of case than in another, except that possibly florid early secondary cases provide them in greatest numbers. Very fibrous non-vascular tissues are resistant. Florid secondary syphilis gives the most dramatic results. There were three cases of pain, stiffness, and swelling of the arm, causing more loss of service, but no permanent damage.

Occasionally resistant ulcerations (particularly those of the pharynx) are met which improve up to a certain point, and then cease to improve, only to yield to vaccine. At times, even though the polymorphous rash of the syphilitic disease disappeared promptly there persisted patches of eczema or infections of other types, which later cleared up under vaccine.

The needle used was of tantalum fixed in a modified McDonagh's holder, this being harder than steel or platino-iridium, not rusting, nor expensive. As to pace it is stated that one operator can deal with 12 cases an hour provided he has very skilled assistants. He has equaled 21 injections in 1½ hours. About 50 per cent of the cases examined after having had salvarsan gave a negative Wassermann.

Of the 2147 injections given to 1000 cases with 13 invalidings, there were no deaths, and 22 clinical relapses readmitted to Kilroy's hospital, two clinical relapses admitted to other naval hospitals, and two occurring in ships. Of 901 cases receiving two injections, 21 cases reached the hospital as relapses, two were known to have recurred in ships, and two have been treated in other naval hospitals.

Of 68 cases receiving three injections, one case reached the hospital as a clinical relapse.

In 14 cases receiving four injections, no case reached the hospital as a clinical relapse.

THE APPLICATION OF IODINE TO THE EXTERNAL AND INTERNAL GENERATIVE ORGANS OF WOMEN.

Bovee (*American Journal of Obstetrics and Diseases of Women and Children*, February, 1913) notes that the greatest and most frequent disadvantage of the iodine method is associated with the dermatitis that follows the application of the drug. It arises mainly from two causes—the use of a tincture of great concentration, and the application of large quantities and collection in the creases and recesses of the skin. As a result of bacteriological experiments Bovee believes that the proper strength is 3½ per cent of crystals dissolved in 95-per-cent alcohol. He holds that the remedy may be profitably applied in the following class of conditions:

Acute infections of the vulva, vagina, urethra, and the whole of the endometrium.

Acute peritoneal infections with proper limitations.

Chronic conditions following infections of these structures and of the tubes, ovaries, and pelvic peritoneum.

In pelvic surgery requiring examinations, manipulations, or operations on or through the vagina.

In such procedures as require opening the cervical canal or uterine cavity from either the vaginal or peritoneal side.

As a routine method of preparation of the field of operation on all these structures as well as the rectum.

He has great confidence in the efficacy of the treatment when applied early in gonococcal infections. If the condition be treated before the infection has passed into the uterine cavity or the glands of Bartholin, it can often be eradicated by one thorough painting of the exposed areas below the uterine cavity. If the first application fails a second made three days later commonly succeeds.

If the vulvovaginal or Skene's glands are involved he makes the same vigorous onslaught, and if the corporeal endometrium be involved the uterus is injected under slight pressure, the patient being

anesthetized for the purpose. Should the infection be due to some other agent the same identical treatment is employed. When one has first treated acute and subacute localized peritonitis thus he is not prepared to find the notable freedom from gaseous distention and from localized pain and the comfort manifested by the patients continuously from the time of operation.

In chronic conditions arising from infections of any portion of the female genital tract he freely applies the iodine and aims always to have it reach the pelvic peritoneum through the uterus and tubes whenever these structures are involved. It is a uniform procedure in subacute and chronic pyosalpinx to inject the uterus and tubes as well as possible with iodine before opening the abdomen. If the appendages are matted down and degenerated from a former infection the remedy is similarly applied.

In pelvic surgery that requires examinations, manipulations, or operations on or through the vagina this plan of local sterilization is far superior to any other used. The iodine requires a maximum of two minutes to prepare the field. He places the anesthetized patient on the operating table and has several students examine her, after which the iodine is applied and the field thus quickly prepared. If complete hysterectomy is required from above the preliminary sterilization of the vagina is of distinct value.

The importance of this vaginal application of iodine is emphasized in radical operation for cancer of the cervix uteri. The high mortality from infection of the peritoneum as a result of breaking of the specimen during its removal and resulting leakage is a striking feature of the recent report of Wertheim's work in this field. This sad complication is best obviated by the use of the iodine to both the vagina and endometrium, preceded by galvanocauterization with or without curettement, if excrescences or craters be present.

The iodine is applied to the skin surfaces of the vulva and the vagina. After the insertion of the Sims speculum and a proper exposure of the vaginal walls and cervix enough iodine is injected to coat over that area covered by the speculum, as soon as the instrument is withdrawn. Exposure of the cervix may be made by either the Sims speculum or some other retractor, and it is grasped by a vulsellum and held firmly for the injection. A glass 2-ounce syringe having a conical end about two inches in length is loaded with the iodine preparation. It is now inserted into the uterine cavity and the fluid slowly injected with or without pressure as one selects. If pressure is employed the syringe is held in place for a period of time, sometimes as much as two minutes. If the peritoneum is to be reached considerable force and perhaps one to two minutes' time as well as all the solution will be required. If only the uterus is to be treated and the tubes avoided, half the solution given with slight pressure quickly stopped will be sufficient. Moreover, if the nozzle be not pressed to the hilt in the external os uteri a return flow will be provided, which lessens the probability of tubal invasion.

THE SURGICAL TREATMENT OF VESICAL PAPILLOMA AND CARCINOMA.

WATSON (*Urologic and Cutaneous Review*, February, 1913) summarizes an admirable study of this subject as follows:

In cases of benign papilloma the method of treatment that would appear to be that of choice in the first instance is destruction of the tumor by the application of the high-frequency current of Oudin.

This treatment should be abandoned as soon as it becomes evident that a recurrent tumor is of malignant nature, and either transperitoneal partial resection of the bladder or total cystectomy (the latter in the small class of patients described as being appropriate for it) substituted for it.

Of these last two methods, the former will be the more generally valuable owing to the fact that it can be applied to a much larger class of patients than the latter, but in that small class to whom the total ex-

tirpation of the bladder can be properly applied, and if that operation is done after the plan suggested by the writer, it is his belief that it will prove a better protection against recurrence than the partial operation, and that its operative and later mortality will be so reduced as to bring it within the sphere of proper and applicable operations and make it reasonably safe.

The operation of suprapubic excision may still be found to be superior with regard to preventing recurrence of benign tumors to the method of treatment by the high-frequency current, and this can only be determined by what is shown with regard to the permanency of the results attained by the latter method after the lapse of some years. The ordinary suprapubic method should be abandoned in cases of vesical carcinoma for the reason that it is evidently much inferior with regard to recurrence to the transperitoneal method of partial resection and probably will be shown to be not less dangerous.

POSTOPERATIVE THROMBOPHLEBITIS.

BURNHAM (*Annals of Surgery,* February, 1913) regards postoperative thrombophlebitis and embolism as a fairly common occurrence. He quotes as explaining thrombosis the theory of Eberth and Schimmelbusch to the effect that the blood platelets play a prominent part and the fibrin a minor one, whilst in the coagulation the relative activity of the two factors is reversed. The blood platelets numbering 180,000 to 780,000 per cubic millimeter are the originators of the typical thrombosis. They may collect about a foreign body, or in consequence of the slowing of the blood stream upon the damaged wall of the vessel, adhering to it and to each other. This process, called agglutination, takes place only in the circulating blood. There is no thrombus formed in the double-ligatured excised vein. Following the formation of these nuclei, consisting almost entirely of blood platelets, there is a rapid accumulation of leucocytes, mostly polynuclears, and following this and possibly consequent to it an accumulation of fibrin mixed with red cells. According to Aschoff a change in the character of the blood is a necessity for thrombosis, whilst its location is determined by a slowing of the blood stream, which may be incident to a widening of the vein with the resultant eddy formation. To this may be added injury or disease of the vessel wall. If this theory be accepted changes in the coagulation time of the blood have no bearing upon the formation, but the viscosity of this fluid may be of distinct importance. In the diseases in which the blood platelets are increased thrombosis is common. As to the question concerning infection, there is usually a period of incubation, and indeed Heidemann holds that the entire process is infectious in character.

Lubarsch examined 215 cases and found that, in spite of the most exact technique, he could demonstrate organisms in only 20 cases. From this fact, and from the fact that thrombophlebitis occurs by preference in the veins of the lower extremities, Klein argues against the infectious theory of the disease. These arguments seem as futile as the argument that rheumatism and tuberculosis are non-infectious because no microörganisms can be demonstrated in the former, and because the latter occurs by preference in the apices of the lungs.

While no definite proof can be cited for or against infection, it is impossible, after examination of a large number of records of the recognized type of postoperative thrombophlebitis, not to feel that the process is the result of one of the milder, self-limited types of non-pyogenic infection. That the infection may be initiated by mechanical or chemical factors, or both, is doubtless true, but the course and symptoms of the disease are too typical of infection to allow of any other conclusion. The blood count was not made in every case, but when made it was always that of a mild infection, the leucocytosis disappearing with the fever. In thirty counts made on 24 patients the average leucocyte count was 14,700, and the average polymorphonuclear count was 87 per cent.

The cases with drainage occurred from two to four days later than cases without drainage, and the cases in which drainage was employed were generally milder and ran a shorter course. This would lead to the hypothesis that the absorption of exudate from the wound predisposes to postoperative phlebitis. In other words, the absorption of the broken-down cellular elements and serous exudate, either with or without the presence of bacteria, causes such change in the blood as to lead to phlebitis and thrombosis. This interesting hypothesis is in accord with many of the known facts and warrants further study. The onset of the phlebitis is always at a period when some absorption has taken place, and usually occurs at a time when absorption is most active. In drainage cases the onset is usually later than in cases of primary union. In nine cases in which the onset occurred on the twentieth day or later, eight cases, or 89 per cent, were drainage cases, and in six cases in which the onset was later than the twentieth day there were no cases of primary union. The conclusion from these figures that in clean cases the liability to phlebitis is past by the twenty-first day, but that in drainage cases the danger of phlebitis persists for a much longer period, seems warranted.

Long confinement to bed has recently been brought forward as a cause of postoperative thrombophlebitis. Klein claims 50 per cent decrease since he has gotten his patients out of bed earlier. In this series 70 cases began while the patient was still in bed, and 19 developed after the patient had been allowed to walk around—surely not a good argument in favor of early walking. Some cases developed even before the average date of onset in patients gotten up during the first week.

It is evident that if we are to stop phlebitis it is necessary to use other measures than merely to get patients out of bed at an earlier date. On the contrary, the records would seem to indicate that the dependent position of the limbs is a factor in the causation of the process.

The large percentage of the cases (82 per cent) began during the second and third week. The earliest case developed on the fourth day, the latest on the thirty-second day. As has been noted, the onset was earlier in the "clean" cases.

Of the complications may be differentiated those occurring before and after the onset of the phlebitis. Of the former, nephritis occurred twice, and gonorrhea, syphilis, influenza, and scarlet fever each developed once before the onset of the phlebitis.

Following the process, embolism occurred in 10 cases, and pleurisy (possibly embolic in origin) occurred four times; pneumonia, malaria, tonsillitis, eczema of the affected leg, cerebral embolism, and hematemesis each occurred once. It may be noted that there was no case ending in suppuration. This would hardly be the case if any of the ordinary pyogenic organisms were responsible for the process. Of the 89 cases analyzed, three died. One death was due to pneumonia (possibly to embolism), one death was due to cerebral embolism, and one was due to gastric hemorrhage on the tenth day following a gastroenterostomy and two days after the onset of phlebitis.

Except for the cases of embolism, the cause of which is well recognized, no complication seemed to bear any noteworthy relation to phlebitis.

Postoperative thrombophlebitis is an infectious disease, a definite entity in some way connected with the absorption of material from the wound.

It is preceded by a slowing of the blood stream, and by local and general disease of the vessel walls.

It occurs at an earlier date in "clean" cases than in drainage cases.

Rest in bed seems to be the only therapeutic measure capable of exerting any marked influence on the severity and course of the disease.

Ichthyol seems to have a direct and constant influence on the local pain.

Internal medication deserves a more thorough trial than it has had previously.

Some of the above conclusions are personal, most are in accord with other ob-

servers; in them an effort has been made to bring out the salient points and to add these cases to the literature in order to hasten, if possible, the final solution of the problem.

A NOTE UPON A METHOD FOR SKIN-GRAFTING THE WOUND DEFECT FOLLOWING REMOVAL OF THE BREAST FOR CARCINOMA.

Bowers (*American Journal of Surgery,* February, 1913) employs a method which he describes as follows:

After removal of the breast, the wound is sewed up as far as the skin will permit without producing too great tension. The open space is left as low as possible, where the skin lies flat to the wound.

The necessary skin to fill out the wound is taken from below the umbilicus in the middle line, of the shape and size of the surface to be covered.

The full thickness of the skin, without fat, is removed. The graft is stitched in place with interrupted sutures.

A dressing of split gutta-percha and sterile gauze wrung out of normal salt solution is applied; then a dry, loose dressing of gauze and cotton and a binder. The binder should not be too tight.

The skin wound where the graft is removed is stitched up with a whip stitch. In patients of the cancer age, the abdomen is usually redundant and the skin is loose, therefore the graft can be spared easily and will stitch up without tension. The following precautions should be observed:

The hemorrhage must be perfectly stanched, as oozing and formation of a clot will prevent union. If the skin graft is large it should be punctured at a few points to permit drainage of serum or blood which might collect under it. There should be plenty of dressings applied to prevent too great pressure on the graft, but, on the other hand, there should be gentle pressure to hold the graft flat to the wound. Occasionally a portion of the surface of the graft will desquamate, but usually enough epithelium is left underneath to rapidly replace it.

THE REMOVAL OF SUPERFLUOUS SKIN FROM AROUND THE NECK FOR HEADACHE.

Under this title Henning (*Memphis Medical Monthly,* March, 1913) reports an operation worthy to be called by his name since in its therapeutic application it has been conceived and carried out by himself alone. Upon a brother physician of forty-eight years, who was a chronic sufferer from gastroenteritis and severe headaches, the latter coming on twice a week and lasting from half a day to three days, Henning performed a unique operation, suggested, doubtless, by the fact that the patient himself noted that by grasping the back of his neck with the right hand and making pressure his pain would be relieved for a time. Twice were large strips of superfluous skin removed from the neck with great betterment, though the patient has sick-headache occasionally when he does not watch his digestion and lets himself become constipated. The beneficial effect from the operation is attributed by Henning to the tightening of the skin and the removal of four pieces, thus supporting the circulation just as an elastic stocking gives support to the varicose veins of the leg.

FISTULA IN ANO.

Tracy (*American Journal of Obstetrics,* January, 1913) describes an operation which he states is uniformly followed by a cure as rapid and complete as that after a simple perineorrhaphy.

The patient is placed in the lithotomy position and the sphincter ani is well stretched. The internal opening of the fistulous tract is located, the bowel is caught with rat-tooth artery forceps (Allis forceps) and cut around the mucocutaneous margin. The bowel is then dissected free until the opening can be drawn down without tension below the sphincter muscle. The excess of tissue is cut away and the bowel sutured to the cutaneous margin. Thus far the operation is identical with that employed for rectovaginal fistula. The external opening of the fistulous tract is

enlarged by cutting outward (away from the anus), the sinus after being curetted or after the diseased tissue has been dissected out is disinfected with Churchill's tincture of iodine, and a little gauze inserted for the purpose of drainage.

He has performed this operation a number of times; convalescence has been rapid and the results have been thoroughly satisfactory. The sphincter ani is not divided, provision is made for free dependent drainage, which eliminates pressure on the bowel, and as there is no leakage to reinfect the sinus the wound heals rapidly.

This technique can be employed in all varieties of fistula in ano, providing the openings in the bowel are not too high, that the bowel is in good condition, and that it can be dissected sufficiently free to be brought down the desired distance.

When the leakage from the bowel, which keeps the sinuses infected, is eliminated, the sinuses after being laid open—not into but away from the lumen of the gut—and treated as sinuses are in other parts of the body, heal in the usual time.

CONTRADICTORY FINDINGS OF THE WASSERMANN TEST.

WOLBARST (*New York Medical Journal*, Feb. 22, 1913) comments at some length and with much strength upon the variation of the reports of the Wassermann reaction dependent upon the uncertain human element. He admits the specificity of the test and its reliability when properly performed. Men who do the best serological work make errors not impossible or uncommon. Wolbarst states that in the course of a study on which is based his present article, competent, honest serologists have sent him contradictory results on the same sera. One man has reported a serum positive, while another, equally competent, has sent a negative report on the same serum taken at the same moment in another test-tube.

Exact standardization seems to be the pivot around which the accuracy of the test depends, yet there does not appear to be any way of telling who is using properly standardized reagents. The general clinician cannot know these things, and still his clinical experience and his reputation are weighed in the balance and often made to suffer as a result of improperly standardized reagents or faulty interpretation on the part of the man upon whom he relies for accurate information.

Wolbarst narrates the case of a young man with absolutely no symptoms of syphilis and a vague history of having suffered from a suspicious angina years ago, who was informed that a Wassermann test might clear up the doubts entertained as to his ever having had syphilis. Blood was drawn in two test-tubes and sent to two laboratories. Laboratory A reported negative; laboratory B, with equal certainty, reported four plus. Four days later blood was drawn again in three test-tubes. One tube was sent to the laboratory A, and the report came back as before, negative; the remaining two tubes were sent to laboratory B, under different names, and both were reported positive, for the second time. Here was certainly a very unsatisfactory state of affairs. One laboratory examines two specimens, four days apart, and reports them both negative; the other laboratory examines three specimens and reports them all strongly positive. The patient was clinically negative. Ten days later blood was drawn for a third time and sent to a third serologist, who in turn reported positive.

Wolbarst submits the findings in 37 cases. The blood was obtained in the usual way by venous puncture and permitted to flow in two or three perfectly clean new test-tubes, about 5 Cc. being collected in each tube and sent to the same laboratory. Different names were attached. The reports agreed in 26 cases (70 per cent). Disagreement in the findings occurred in 11 cases (30 per cent). Of the latter, in six cases the variation was not very great, there being two cases varying from doubtful to positive, and four cases varying from doubtful to negative. In five cases, however, there was a distinct contradiction, one

laboratory reporting positive and the other negative on the same serum. It is thus seen that in five cases out of a total of thirty-seven (14 per cent), the serologists flatly contradicted each other as to the result. It will also be observed that certain serologists uniformly obtained positive results, while negative results seemed to predominate simultaneously at the hands of the other workers. The inference is clear that whenever serum is to be examined, the results of the test are subject to variation at the hands of different serologists, and that certain steps must be taken to overcome these chances of variation.

It therefore seems plain that the physician must submit the serum for examination only to such men as will do the work honestly and skilfully according to the most approved methods. Also, the work of any expert should be checked and controlled by one or more equally good experts to whom should be submitted the serum drawn simultaneously from the patient. If the results agree, we are bound by all the rules of common sense to accept such opinion as the sum total of our knowledge on this particular subject. If the results disagree, another quantity of serum should be subjected either to the same or to other serologists.

Wolbarst completes his article as follows:

The Wassermann reaction is dependent for its result on the skill and knowledge of the serologist.

The results of the test depend in great measure on the absolutely perfect standardization of the reagents used; these are subject to variation in the hands of different serologists.

As a result of these differences, diversity in results is not infrequent, but insufficient attention has hitherto been given to this particular feature of the reaction.

It is a gross error to accept the findings of one serologist as conclusive, particularly if his result is positive and the diagnosis dependent on his report; his work should be checked up by one or more equally competent workers.

If two or more competent serologists report on a given serum, the majority opinion may be accepted as fairly conclusive; frequent reëxaminations are always of advantage to the patient.

Of thirty-seven cases thus studied for discrepancies, agreement of findings took place in twenty-six (70 per cent); absolute contradiction of findings took place in five cases (14 per cent); slight disagreements took place in six cases (16 per cent).

All mention of results of the Wassermann test, in the literature or elsewhere, should be accompanied by the name of the serologist who made the test, in order that the measure of accuracy and skill employed may be estimated.

DIFFICULTIES IN THE DIAGNOSIS OF GALL-STONES.

BUNTS (*Cleveland Medical Journal*, March, 1913) states that the diagnostic errors may be reduced to a minimum by careful observations of the following admonitions:

One must have a clear picture of gall-stone attacks. This is probably familiar to every one, and if not is to be found best in any surgical monograph upon the subject.

Never accept a diagnosis of acute indigestion as satisfactory unless the possibility of gall-bladder disease has been considered and definitely eliminated.

Resort to the use of the *x*-ray by an expert when there is a reasonable doubt as to the existence of renal or ureteral calculi.

Always consider with the greatest care and minutest scrutiny the history of each previous attack when the question of appendicitis is raised, paying particular attention to the time and apparent cause of the attacks, duration, degree of fever, of rigidity, and, after subsidence of the acute pain, the location and persistence of tenderness.

In connection with the history of pain it is interesting to note how many times repeated hypodermics of morphine have been found necessary in gall-stone attacks and how seldom they have been given, or at most repeated, in appendiceal attacks.

Carcinoma of the liver is nearly always a secondary growth and may or may not be associated with gall-bladder disease. When it occurs at the cystic end, there is continuously increasing involvement of the common duct, causing progressive jaundice. It must be remembered, however, that the early appearing jaundice accompanying carcinoma of the gall-bladder or ducts may be instrumental in causing a catarrhal jaundice which will clear up temporarily or to a limited extent under appropriate medical treatment, thus obscuring for a time the real gravity of the case, but in any considerable carcinomatous involvement of the common duct the jaundice is permanent and progressive.

EXCISION OF THE LARYNX FOR MALIGNANT DISEASE.

NASH (*Australasian Medical Gazette*, March, 1913) thus describes his operation on a man seventy years of age. With the head stretched back over a pillow an incision was made over the hyoid bone to the sternal notch, and the tissues divided down to the deep cervical fascia. Many bleeding points required pressure forceps. The incision was deepened to the visceral layer of the cervical fascia. When doing this the space in the deep cervical fascia at the sternal notch was opened; some troublesome bleeding followed from veins and arteries in the space. The pretracheal layer of fascia was not a very well-defined tissue at the midline of the neck; it lay close to the larynx and trachea, and the separating of it to right and left was only satisfactory when the sides of the larynx were exposed; then, with the handle of the knife and the fingers, the inner aspects of the carotid sheaths were reached, and sweeping the fingers up and down, the sides of the larynx and the trachea were well felt, and the region of the esophagus palpated. Division of the pretracheal fascia from the hyoid bone to the thyroid gland in the middle line was completed. The right lobe of the thyroid gland was enlarged. The isthmus of the thyroid was divided, ligatured outside the forceps, and held aside by the ligatures. At the level of the lower edge of the hyoid bone the tissues and skin to the pretracheal fascia were divided outward, on either side, with scissors. There were then two flaps, the deepest parts of either being the inner aspects of the carotid sheaths. When the flaps and the lobes of the thyroid gland were drawn aside the thyrohyoid membrane, the larynx, and the trachea were fully exposed, except for their posterior surfaces, as far down as the episternal notch, while the regions of the esophagus and pharynx were visible. The cricoid cartilage and adjacent rings of the trachea were next separated from the esophagus. This was the most troublesome step in the operation, owing to the mobility of the esophageal wall. The tubes were separated upward and downward.

Silk threads on a round needle were passed through the sides of the trachea, grasping a ring of cartilage. These threads were left long, and were grasped by pressure forceps. The trachea was now lifted forward, and divided below the lower margin of the cricoid cartilage obliquely from before upward and backward.

The lower segment of the air tube was drawn well forward with the threads. From this point the anesthetic was administered on a towel through the severed trachea. The larynx was lifted forward by forceps, and by blunt dissection was separated from the esophagus up to the region of the inferior constrictor muscle; this was raised off the cricoid cartilage and pressed aside. The larynx was again drawn forward, and the anterior wall of the pharynx was pushed backward till the apices of the superior cornua of the thyroid cartilage were reached. An opening was made outside the apex of each great cornu into the pharynx. Pressure forceps were then placed on the pharyngeal wall, and with the scissors a cut was made from right to left, one blade being on the outside of the thyrohyoid membrane, and the other in the pharynx between the tongue and the epiglottis. On completing this incision the larynx and epiglottis were freed. A considerable gap was

left in the anterior and lateral walls of the pharynx.

The pharyngeal wall was sewn to the tissues just below the hyoid bone, the mucous membrane being inverted at all points. A thumb needle armed with catgut was suited to the necessities of the situation. The esophagus had not been opened along its course. There was no difficulty with bleeding in the immediate esophageal or tracheal planes. Before the trachea was severed the patient was placed in the Trendelenburg position. With a round needle the capsule of the thyroid gland was picked up, and the sides of the isthmus approximated with two catgut stitches behind the trachea. This helped to push forward the trachea, and formed a soft cushion for it to rest upon. The tracheal opening was attached to the skin margins by silk sutures, a short distance above the episternal notch. The muscular and fascial layers were sewn together with catgut along the whole extent of the wound. A small piece of iodoform gauze was placed *in situ* near the hyoid bone. The skin incisions were closed with continuous sutures of iodized silk.

SOME STUDIES IN SHOCK.

Colcord (*International Journal of Surgery*, March, 1913) apparently accepts as the best definition of shock the view of Gray and Parsons, to the effect that it is the reaction of the central nervous system to exaggerated or abnormal afferent impulses. Crile's views are quoted at length. Crile holds that every nerve center has a given amount of energy which can be paid out in the ordinary demands of life and may last a lifetime, or it may all be paid out in a few minutes or hours in response to the powerful stimuli producing shock. In every animal, from man down to the lowest protozoön, is a nervous mechanism which responds to stimulation and whose purposes are to protect, perpetuate, give pleasure, etc. The development of this in man is the result of ages of growth, following the laws of heredity, back to primal man, back to the lower animals, and on back to the protozoön. Every stimulus carried to the higher centers is interpreted by association with past impressions, either of the individual or of some ancestor, near or remote.

In each organ are certain receptors for receiving these impressions and sending them on upward by way of afferent nerves to the higher centers in the brain.

Those receptors which receive impressions which lead to pleasure or well-being are called "beneceptors."

Those receiving impressions leading to harm or pain are called "nociceptors."

These impressions are interpreted by the higher centers into "bene-association" impulses and "noci-association" impulses.

If the sensation is one associated with past injury it causes fear—not fear as we ordinarily use the term, but as Crile uses it, "fear in its broader sense; conscious, subconscious, or unconscious fear, the instinct of the tissues, born of ages of association, to get away from the something which is about to injure them." It is not so much the memory of past pain, nor yet the present pain, but the fear of future pain that causes shock; hence the term "noci-association." The noci-impulses may come by any of the afferent nerves—touch, pain, pressure, sight, hearing, taste, or smell.

The efferent messages having been interpreted into noci-association impulses cause more or less powerful responses, according to their intensity. If the mind is conscious there may be accompanying higher emotions, and motor impulses may be sent out to the appropriate muscular groups through efferent nerves. If there is unconsciousness motor impulses may still be sent out from subordinate reflex centers. From the higher centers noci-messages are sent to the vital centers, especially those affecting the heart, the respiratory center, and the vasomotor center. The last named is the all-important one in its relation to shock. Stimuli to this center, at first, usually cause a rise in blood-pressure, but if they are powerful and long-continued they finally exhaust it and there is a fall. If the noci-

impulses continue, the exhaustion is complete, and though the noci-impulses are stopped and every measure is used to restore the center to action, the individual dies of shock.

Other centers in the cerebral cortex are also powerfully affected and rapidly pay out their stored-up energy until exhausted.

Physical injury of any sensitive part—that is, any part having nociceptors—causes a discharge of nervous energy leading ultimately to exhaustion. This discharge of nervous energy is not prevented by inhalation anesthesia. This exhaustion is due to driving the motor mechanism. With equal facility may exhaustion be produced by perceptions through the special senses, such as seeing or hearing danger. The human motor mechanism may be driven by a physical contact stimulation of the nociceptors implanted within the body, or it may be driven by perceptions through the special senses. Whatever the cause may be, the stimulus is always through the awakening of associative memory; that is, all action is on the law of association through memory—phylogenetic association.

Henderson's views markedly differ from Crile's and are based on the following argument:

In 103 of Crile's experiments, respiration alone failed in 90. In order to bring the animal to a stage of surgical shock, *i.e.*, low blood-pressure, it was necessary to prolong the animal's life with artificial respiration or to vigorously irritate some afferent nerve to force the respiratory center to act.

During the stage of low arterial pressure the small arteries are contracted, not relaxed. When the circulation fails it is due to diminished volume of blood caused by a passage of the fluid of the blood out into the tissues.

Low blood-pressure is not due to any fatigue or inhibition of the vasomotor center. This center does its duty almost to the last.

The pain, fright, etc., causing death in severe injuries produce accelerated breathing. This lowers the amount of CO_2 in the blood. But CO_2 is the natural stimulant of the respiratory center, and when this falls below a given level the center ceases to act—*i.e.*, we stop breathing. This condition of deficient CO_2 is called acapnia (Mosso), meaning smokelessness.

The respiratory center does not act automatically, nor is it affected by oxygen hunger. It is only affected by CO_2 in the blood; when this is withdrawn death ensues from lack of oxygen. As long as there is sufficient CO_2 in the blood, pain may stimulate the center and so keep up the respiration, but if the pain is suddenly withdrawn while the CO_2 in the blood is low, there is apnea—*i.e.*, breathing stops, and the animal dies from respiratory failure. This has been repeatedly verified by experiments on dogs.

In acute "apnea vera" death may ensue from lack of oxygen or from failure of the circulation. As soon as insufficient oxygen is fed to the tissues, there is a devolopment of acids in the blood which causes the lividity of asphyxiation. This "acidosis" causes changes in the body cells and vessel walls and a transudation of serum from the blood-vessels into the tissues — the real cause of lowered blood-pressure.

Anesthesia lowers the sensitiveness of the respiratory center to CO_2.

If a man voluntarily breathes rapidly for several minutes (hyperapnea) the oxygen in the blood is increased and the CO_2 is decreased. If he then stops voluntary breathing there is no desire to breathe; the breath stops and may so remain for several minutes, until enough CO_2 has accumulated to again stimulate the respiratory center. This condition can be imitated by pumping air into the lungs of a dog for twenty or thirty minutes. On stopping the pumping the dog lies quiet for several minutes without breathing. In several of the experiments the dogs died in about eight minutes.

If oxygen containing 5 or 6 per cent CO_2 be administered to an animal with acute apnea vera, the animal is restored and normal breathing commences.

If the experiment of irritating the sciatic nerve to produce accelerated breathing for several minutes be repeated with a paper

bag over the face, or the animal breathes through a piece of tubing several feet long, so that the expired air is rebreathed and the CO_2 is not lowered, there is no acapnia, no apnea, and no shock.

The elaborate and accurate experimental and clinical researches by Gray and Parsons are summarized as follows:

In examination histologically of brains, spinal cords, and medullæ of animals dying of shock, few changes are found in nerve cells. There are no signs of exhaustion in the region supposed to contain the vasomotor center.

When the vasomotor center fails to respond to powerful stimuli applied to afferent nerves in profound shock, it is not due to exhaustion of the center itself, nor of efferent motor nerves, but to exhaustion of the synapses of the afferent (sensory) nerves. The center itself will still respond powerfully to direct stimuli (electricity, needle puncture, etc.), even when the shocked dog is in a dying condition. These facts seem to be proven by Gray and Parsons, both histologically and clinically.

It should be remembered that dendrites always carry messages toward the cell and that the axis cylinder carries messages from the cell. The axon usually ends in several small branches called a "brush." We do not know whether the fibers of the brush really connect with the dendrites of the next neuron above it or not. The message may jump across, as the electric spark jumps across a gap. This connection between brush and dendrites is called a "synapse."

Where the telephone wire enters our house is a short segment of wire (fuse) easily burned out. If lightning strikes our telephone wire the fuse burns out and so we are protected from the powerful current. In the same way we have a weak point in these afferent conduction paths. If the stimuli are too strong the synapses become exhausted (synaptic block) and our higher nerve centers are protected.

Synaptic block of afferent nerves appears, at first, only in the injured nerve, then in near-by nerves, and when shock is profound and blood-pressure is low, conduction fails in all afferent nerves of the body.

If before shock is too profound strychnine be administered, the conduction over the synapses will be restored and the vasomotor center will once more respond to stimuli applied to afferent nerves.

From every organ there are two sets of nerves leading to the vasomotor center:

(*a*) "Pressor" nerves whose stimulation causes a rise in blood-pressure.

(*b*) "Depressor" nerves causing a fall in blood-pressure.

In some organs the pressor nerves predominate and in some the depressor. After the pressor set of nerves in an organ are powerfully stimulated for a time they become exhausted and the depressor ones act, causing a fall in blood-pressure.

Other symptoms of shock may begin before the blood-pressure falls, but all shock is sooner or later accompanied by a fall in blood-pressure, and this one symptom is the most important factor in shock.

Collapse may appear in other conditions than shock, as acute infections, hemorrhage, effects of chilling, etc., but is often an end result of shock, though not identical with it.

There are both pressor and depressor paths from the centers of consciousness to the vasomotor center. "Activity of the higher centers raises the blood-pressure proportionately to its intensity," but as soon as pressor paths are fatigued, depressor impulses predominate. Powerful emotion may produce such violent stimuli to the vasomotor center as to cause profound or even fatal shock.

Toxins circulating in the blood "affect the synapses and render pressor fatigue more likely." Among these are the toxins of exophthalmic goitre, lymphatism, the acute infections, chloroform, ether, etc.

Shock may be conveniently divided into two stages:

(*a*) The pressor stage while the blood-pressure is higher than normal, but during which the pressor paths are becoming exhausted.

(*b*) The depressor stage while the blood-

pressure is low. The pressor paths are now exhausted—there is synaptic block and depressor impulses predominate.

During the first stage the arteries are contracted. During the second they are neither contracted nor dilated, but preserve their normal tone independently of the vasomotor center.

CONSECUTIVE DISPLACEMENT OF THE CEREBRAL HEMISPHERE IN THE LOCALIZATION AND REMOVAL OF INTRACEREBRAL TUMORS AND HEMORRHAGES.

HUDSON (*Annals of Surgery*, April, 1913) after an osteoplastic approach to the brain in search of a tumor, which he failed to find, and after the death of his patient forty-eight hours later, floated the brain into a bucket of cold saturated salt solution, the bottom of the bucket having previously been nested with cotton. About two hours after the autopsy the brain was carefully examined and two conditions, especially, carefully noted: First, the great amount of damage done the hemisphere by being forced into the operative opening in the bone by the increased intracranial pressure; secondly, the tumor, which was located in the center of the operative opening and about three-quarters of an inch below the cortex, became clearly palpable with the finger-tips when the tension had been released by the removal of brain from the skull.

From this case the principles presented in his present paper have been developed. Surgery of the cerebellum, which has been the most unpromising field of cranial surgery, has been transformed into the most successful by improvement in instruments and by the making of an operative approach to the cerebellum, which releases the pressure in the entire cerebellar fossa.

The entire cerebral hemisphere may be displaced in a backward direction by the making of a sufficiently large bone flap. Indeed, the advantages of the operation are a more accurate localization of the tumor; the operation can be carried out in a much more satisfactory manner; the tension is distributed in such a way as to be greatly minimized; and in reality this tension is the most potent factor in preventing the proper surgical procedure.

Hudson records the case of an apoplexy in which the patient was apparently dying. A wide flap was formed allowing backward displacement of the brain, after which the patient immediately began to breathe. Palpation of the dura showed a point more prominent than any other. Through this point the dura was incised, when immediately the cortex in the apex of a convolution ruptured; several clots of blood and a quantity of fluid blood were forcibly thrown out. At this point the patient's condition immediately improved in the most marked manner. The hemorrhage from the cavity in the brain was quite profuse, but was eventually controlled with bits of dry cotton. The dura was not closed, and the finger of a rubber glove was caught with a stitch of fine catgut in the lower border of the opening in it. The brain at this point occupied its normal position within the dura, the abnormal tension produced by the hemorrhage having apparently disappeared. The bone flap was closed down and the scalp closed, the rubber drainage being brought out through an original trephine opening in the skull and the original incision in the dura. The hemorrhage was rather free for three or four days and continued until the eighth, necessitating daily changes of dressing. The patient rapidly recovered, and was walking about the hospital from the fourth to the twelfth day, when he left.

In the control of hemorrhage the brain should be invariably exposed over a large area and in such a manner as to permit of the consecutive displacement of the entire hemisphere. Moreover, only one bone flap should be made, the anterior border of which should generally be represented by a line running straight upward from a point just in front of the condyle of the lower jaw.

According to pathologists fully 50 per cent of intracerebral hemorrhages involve the internal capsule; therefore a point about two inches above the external opening of the ear, and posterior to the fissure of Rolando, should be selected for puncturing the brain in search of the hemorrhage. No opening in the dura, however, should be made until all aid possible has been gotten by palpating the exposed area of brain with the dura intact. Should any portion of the brain be found more protuberant or denser than any other, this perhaps should be the point of puncture.

As to operative technique where exposure of the brain is made in such way as to allow the displacement of the hemisphere, this implies many channels and several skull openings. The work must be done quickly and easily and in such manner that the patient will receive the smallest amount of shock or jar, nor should the surgeon's fingers or hands become fatigued, or his sense of touch be interfered with. This requires an entirely new surgical armamentarium, represented by self-stopping trephines and powerful two-hand channel-cutting forceps, and many other new instruments for cranial surgery.

In making the large bone flap the preservation of the scalp must be considered.

After shaving and disinfection of the skin, several primary openings are made outlining the bone flap. Two short bevels about three-quarters of an inch long are made at suitable points with the finest Gigli wire saw. The rest of the flap is made by cutting a channel about one-eighth of an inch wide around the bone flap. To properly control the bleeding in the bone it is necessary that this channel be at least one-eighth of an inch wide to allow the proper insertion of bone wax should bleeding occur. Where the bone is cut with a saw, bleeding is very common. Where it is cut with forceps it never occurs, as the diploe of the bone is tightly closed by the crushing action of the forceps. After the bone flap has been outlined it is carefully tried with the lever ends of the dural separators. If the base does not readily break it is weakened by cutting under the temporal muscle and scalp, on one or both sides, until the breaking is easily accomplished. There may be many points of troublesome bleeding on the surface of the dura. These are best stopped by cutting small pieces of the temporal muscles and sticking them over the bleeding points until they adhere.

If an apoplectic clot has been evacuated the dura should be closed. All cases should be drained, preferably from the cavity of the brain, by several soft strips of rubber tissue. These may be carried to the surface by stitching a piece of rubber at the most suitable angle of the dural opening, making a small trephine opening in the bone flap.

In the case of unremovable tumors, the bone flap is fixed down with expanding wire suture, the method to be applied where the operation failed to find and remove the cause of pressure.

The best method of closing the dura is with fine, curved needles and fine silk applied as is interrupted silk in continuous suture, the silk having been sterilized in vaselin. When the scalp flap is formed two nicks are made in the free border on both sides so that the flap may be accurately adjusted in closing. The closure must also be quickly done, and two long needles are used. Fine silk is the suture material. The two needles are inserted together about three-sixteenths of an inch apart. They go entirely through the thickness of the scalp. No. 1 is first tied, while No. 2 remains in the scalp. No. 1 is then advanced beyond No. 2 and inserted through the scalp again. No. 2 is pulled through and the silk thread tied. This is repeated until the entire scalp wound is closed.

This method prevents the inversion of the edges of the scalp and allows the taking of the entire thickness of the soft tissues within the grasp of each ligature, so that no blood-vessels in the entire incised scalp require tying. The method is very quick and satisfactory.

From six to ten primary openings are often made in the skull, thus serving as

safety stations, and to expedite the cutting of the channels in the bone which outline the large bone flaps.

The burrs stop automatically just where they should stop when the hole is being made through the bone. The narrow channels are made with powerful cutting forceps, cutting from within outward.

REVIEWS.

MANUAL OF EMBRYOLOGY. Written by Charles R. Bardeen, Madison, Wis.; Herbert M. Evans, Baltimore, Md.; Walter Felix, Zurich; Otto Grosser, Prague; Franz Keibel, Freiburg i. Br.; Frederic T. Lewis, Boston, Mass.; Warren H. Lewis, Baltimore, Md.; J. Playfair McMurrich, Toronto; Franklin P. Mall, Baltimore, Md.; Charles S. Minot, Boston, Mass.; Felix Pinkus, Berlin; Florence R. Sabin, Baltimore, Md.; George L. Streeter, Ann Arbor, Mich.; Julius Tandler, Vienna; Emil Zuckerkandl, Vienna. Edited by Franz Keibel, Professor in the University of Freiburg i. Br., and Franklin P. Mall, Professor of Anatomy in the Johns Hopkins University, Baltimore, U. S. A. In Two Volumes. Volume II. With 658 Illustrations. Philadelphia and London, J. B. Lippincott Company, 1912. Pp. vii and 1032. Price $10.

Until quite recently those interested in the minute details of human embryology were, for the most part, obliged to seek in a language of Europe the record of the untiring labors of foreign research. Without wishing to minimize the splendid record of English embryologists it may be said that, as a science, modern embryology owes many of its achievements to the untiring energy of Germany's faithful devotees of investigation. Difficult as comparative embryology has been the labor necessary for its comprehension found abundant material easy of access and adequate in quantity. With human embryology conditions are much different; material is rarely available, often abnormal, the chronology only approximately ascertainable, and to no one man has been given the succession of keys necessary to open the many-keyed lock. Too much of human embryology has been immaturely deduced from comparative studies and imperfectly controlled by careful investigation of human material.

It is but natural and proper that two students of the great His — the technical founder of modern embryologic methods— should produce, simultaneously, in their respective languages, the conjointly edited volume before us. It is a most comprehensive exposition of the subject, for which all interested in human embryology should be profoundly grateful. The work is practically a continuation of the preceding volume. The first chapter, devoted to the Nervous System, is by George L. Streeter of Ann Arbor. This is succeeded by chapters on the Development of the Chromaffin System by E. Zuckerkandl of Vienna; the Development of the Sense Organs by Franz Keibel of Freiburg; the Development of the Digestive Tract and of the Organs of Respiration by O. Grosser of Prague, F. T. Lewis of Boston, and J. P. McMurrich of Toronto; the Development of the Blood, the Vascular System and the Spleen (including both Blood and Lymph Vascular Systems) by C. S. Minot of Boston, H. M. Evans of Baltimore, J. Tandler of Vienna, and F. R. Sabin of Baltimore; the Development of the Urogenital System by W. Felix of Zurich; and finally, by a brief epitome of the Interdependence of the Various Developmental Processes by one of the editors, Prof. F. Keibel of Freiburg. As will be noted, the volume is an international product, no little credit being recognized as due to the excellent work done in this country.

Space does not permit detailed discussion of each chapter, and selection would imply a distinction—possibly invidious and probably possessing no special merit. The volume is notably well balanced, and although room for difference of opinion must always exist, the space allotment seems wisely distributed. The editors have been no mere figureheads; in the two volumes each has contributed most valuable material. Apparently the editing has been

wisely done without being obtrusive; collaborators have not been robbed of their individuality. There are overlappings, but for the most part these appear wholly unavoidable and adequately minimized. One of the most noteworthy and commendable features frequently apparent is the recognized incompleteness of our knowledge; any hiatus is frankly admitted and fully stated. Inferences, no doubt often correct but drawn from comparative embryology, are credited to their proper sources and are given due but not excessive weight. The literature is presented with fair completeness, but no doubt delays incident to simultaneous publication on two continents has rendered omission of reference more recent than about two years. The illustrations are numerous, wisely selected, and superbly reproduced. The press-work and binding are of superior type. The work can be thoroughly recommended.

W. M. L. C.

THE MODERN TREATMENT OF NERVOUS AND MENTAL DISEASES. By American and British Authors. Edited by William A. White, M.D., and Smith E. Jelliffe, A.M., M.D., Ph.D. Volume I, Illustrated. Lea & Febiger, Philadelphia. 1913.

This is a so-called System of Modern Treatment. The first volume which has just appeared contains articles by nineteen different contributors, most of whom are well known to the medical profession and particularly to their fellow neurologists. Dr. White, one of the editors, writes the chapter upon Eugenics and Heredity in Nervous and Mental Diseases. Havelock Ellis contributes another article of forty-three pages upon sexual problems, their nervous and mental relation, and Dr. Henry H. Goddard writes upon the educational treatment of the feeble-minded. An important chapter is the last one in the volume, on the functions of the hospital in nervous and mental disorders, by Dr. James V. May, and still another of very general interest is one upon the treatment of paranoic and paranoid states by Adolph Meyer, who is in charge of the recently completed Phipps Clinic in Baltimore. These citations serve to give some idea of the scope of the work, the first volume containing nearly nine hundred pages. As neurology is one of the departments of medicine in which therapeutics have been supposed to have a comparatively limited scope, it is interesting to find that such an exhaustive publication can be compiled along these lines. Undoubtedly all neurologists will possess themselves of the volume, and certainly physicians who are attached to various institutions, public or private, which deal with nervous or mental cases must possess it if they are to feel that they are fully abreast of the times and are to be possessed of a competent and accurate guide.

OPHTHALMOLOGY FOR VETERINARIANS. By Walter N. Sharp, M.D. The W. B. Saunders Co., Philadelphia, 1913. Price $2.00.

Our readers will be somewhat surprised to find that there is room for a volume dealing with veterinary ophthalmology. The author has nevertheless managed to compile a book of about two hundred pages with much interesting information concerning diseases of the eye in the lower animals. Naturally there is not much difference between many of the operative procedures in animals from those which are resorted to in man. Indeed, nearly every illustration in the present volume is taken from de Schweinitz's well-known book upon Diseases of the Eye.

A MANUAL OF MEDICINE FOR NURSES. Second Edition, Rewritten and Enlarged. By George H. Hoxie, M.D. The W. B. Saunders Company, Philadelphia, 1913. Price $1.50.

The nucleus for this little book was a course of lectures delivered before a class in Domestic Science at the University of Kansas and later developed into a course of lectures for nurses, in the same institution. Five years ago the first edition appeared under the title of "A Practice of Medicine for Nurses." We agree with the author that the present title is more suitable. The material in the second edition has been rearranged and brought up to date, and the author states that there is evidence to indicate that mothers as well as nurses have

been glad to avail themselves of the information it contains. We do not feel that we can recommend it to the average mother as it is too technical, at least in the sense that it gives her information which in her ignorance she is not able to correctly value. It is, however, an excellent book for the trained nurse. We can see no object in illustrations of respiratory curves, as, for example, the tracing showing Biot's type of respiration. Some of the other charts, however, are excellent.

INSURANCE MEDICINE. Being Suggestions to Medical Examiners. By Henry H. Schroeder, M.D. William Wood & Co., New York, 1913. Price $2.00.

The author, who is the Medical Director of the Mutual Life Insurance Co. of New York, has already published the contents of this book in a series of articles contributed to the *Medical Record*. In its pages the author emphasizes the need of the exercise of tact and judgment and discusses the time and place of examination and the methods to be employed in examining an applicant, and also discusses the personal and family history of the individual. There is also a special chapter upon the examination of women, and a final one upon fraudulent practices.

THE OPERATING-ROOM AND PATIENT. Third Edition, Rewritten and Enlarged. By Russell S. Fowler, M.D. W. B. Saunders Company, Philadelphia and London, 1913.

That a third edition of Fowler's Manual has been called for abundantly attests the popularity of the subject and proves the thoroughness with which the needs of the profession have been met. The author states that simplification and standardization are the key-notes of the hour and are intended to be exemplified in the book throughout. The subject-matter covered includes the operating-room, preparation of instruments and supplies, bandaging, anesthesia, preliminary and after-treatment, both systemic and local, operations upon special tissues and in special regions, and finally a list of instruments and dressings commonly employed for various operations.

The advice given is in the main so good that it seems worth while to call attention to some minor points concerning which the book does not accord with usual practices. Thus for spinal analgesia cocaine is rarely used at the present day. Even for local anesthesia it is usually supplemented by a less toxic drug and one that can be sterilized by boiling; nor, even should cocaine be employed, are the strengths advised those customarily used. Acapnea is treated much more seriously than surgical experience justifies. Concerning the preoperative preparation in its special relation to the urinary system no mention is made of continuous catheterization. When intermittent catheterization is employed its time of repetition is influenced entirely by the rapidity of secretion. In speaking of operations upon the thyroid it is stated as a fact that patients who have had the slightest dilatation of the heart should not be prepared for general but for local anesthesia. The method of preparing the hands is time-consuming and irritating, nor is it customary to put on gloves wet from bichloride solution, nor to trim the nails to the quick, nor to use wire nail-cleaners. Moreover, there is a general feeling that alcohol is one of the most important parts of hand disinfection. In Fowler's description this is omitted entirely. The method of cleansing by iodine is not discussed. The method of keeping hot the solution used in proctolysis—*i.e.*, by bags tied to the receptacle—is, of course, entirely inadequate. In using the catheter the most important precaution in the prevention of infection—*i.e.*, a preliminary antiseptic flushing of the urethra—is omitted. The treatment of acute erysipelas by streptococcic vaccination is not in accordance with the principles governing the application of this remedy. Washing out of the bladder, to prevent absorption through its walls of carbolic acid eliminated in the urine, is a therapeutic measure suggested without due consideration of bladder function. The gloomy prognosis of ischemic palsy is scarcely justified by clinical facts. Moreover, the con-

dition is rare except following fractures of the forearm, and is rare even after these injuries. These facts would seem worthy of mention. It is stated that in patients with weak heart, in old people, and in debilitated patients long rest in bed is sufficient to cause thrombosis of the femoral vein. This would be interesting if it were corroborated by experience. It is advised to leave skin sutures at least seven days; if there are no symptoms of irritation, ten days or even fourteen to twenty-one days in cases in which the tension is very great. This advice is not calculated to lessen the resultant cicatrix, nor does the simple painting of the surrounding skin with collodion seem adequate to provide support. The further advice to use adhesive plaster is excellent. Vertical suspension is suggested as a means of preventing gangrene in high ligation of the femoral vein. In regard to lymphangioplasty the operation is not described, except by reference to Handley's original article, Fowler simply stating that the precise amount of shrinkage is shown by careful measurements before and after operation. For the treatment of impacted fracture of the neck of the femur Whitman's method is described. Maxwell's highly successful anatomic method is not even mentioned. In applying a dressing after amputation of the breast, bandaging is far better facilitated by the broad palm of an assistant braced by his elbow upon the table than by a Volkmann block.

After all these are minor criticisms. Fowler's book can be read with profit by both the occasional and the habitual operator.

THE COLLECTED WORKS OF CHRISTIAN FENGER, M.D. Edited by Ludvig Hektoen, M.D. Two Volumes. W. B. Saunders Company, Philadelphia and London, 1912.

These volumes, prefaced by a brief autobiography, have been published by the Fenger Memorial Association in response to requests from Dr. Fenger's assistants and pupils and the wishes expressed by many surgeons in various parts of the country. There are in all upwards of seventy-five papers, covering an extraordinarily wide range of subjects. One of the longer papers, on Cancer of the Stomach with Special Reference to its Structure, Development, and Extension, is his thesis for the degree of Doctor of Medicine, which was defended in 1874. It is perhaps with the surgery of the kidney and ureter that his name is most identified, and it is to this department of surgery that he has made the most valuable contributions. It is therefore true that even did the book contain nothing else it would be of value to the surgeon because therein are to be found his classical papers upon Surgery of the Ureter, Operation for the Relief of Valve Formation in Stricture of the Ureter in Hydronephrosis or Pyonephrosis, Conservative Operative Treatment of Sacculated Kidney, Cystonephrosis, Operation for Valvular Stricture of the Ureter, Diseases of the Ureter, Diseases of the Kidney Amenable to Surgical Treatment, and Surgery of the Kidney.

With thoracic, abdominal, and cephalic surgery the author was also steadily busied. His work has a scholarly thoroughness, the touch of originality, and the ring of absolute sincerity. It is essentially modern, even in these days of rapid progress. Indeed to the searcher after cause and the investigator for truth his writings may well serve as models.

COLLECTED PAPERS BY THE STAFF OF ST. MARY'S HOSPITAL (MAYO CLINIC). W. B. Saunders Company, Philadelphia and London, 1911.

This beautifully printed and illustrated volume contains in addition to papers contributed by William and Charles Mayo, those of Plummer, Graham, Braasch, Beckman, Judd, Wilson, and others, representing the extraordinary efficiency and activity of the Mayo clinic. The work is really beyond all praise, and though the honors are carried off by the Mayos, the stimulus of their personality and example is shown by the contributions of their associates, each one of which is a distinctly valuable addition to surgical knowledge and literature. To the clinical surgeon this book serves as a guide

to all that is best and most recent in the lines upon which it touches. To those who appreciate the splendid work done by the Mayos in the uplift of modern surgery and the education of the surgical profession it is a worthy expression of what they have accomplished and are accomplishing.

A Collection of Papers Published Previous to 1909. By William J. Mayo and Charles H. Mayo. In Two Volumes. W. B. Saunders Company, Philadelphia, 1912.

These contributions to modern surgical literature, admirably printed and illustrated by Saunders, appear in two volumes and include the contributions of William J. and Charles H. Mayo from the time of their graduation from medical college to February, 1909. The papers are published in the main in chronological order, with due reference to the classification under Alimentary Canal, Stomach, Liver and Gall-bladder, Pancreas, Genito-urinary Organs, Vascular System, Head, Central Nervous System, Neck, Thyroid, Thorax, Bones and Joints, Principles of Surgery, Travelog and Addresses; followed by an excellent bibliographic index and an index of subjects.

It is interesting to note that while the earlier papers are based on a comparatively limited experience, there is found in them the same keenness of vision for the immediate and remote need of things, the same wise choice of methods, and the same successful results which so preëminently distinguish the utterances of a later date, based as these are on a clinical experience unequaled in any of the world's surgical centers. Nor can the student in medicine, the practitioner in this branch of the profession, nor the clinical surgeon find anywhere more helpful reading than these books afford.

CORRESPONDENCE.

WIESBADEN LETTER.

THE GERMAN CONGRESS FOR INTERNAL MEDICINE.

The German Congress for Internal Medicine was opened on the 15th of April by its president, Professor Penzoldt (Erlangen). After a memorial address and the usual presidential address the congress quickly proceeded to its routine.

The first symposium, "On Fever," was opened by Professor Meyer, of Vienna. The heat of the body is produced by chemical processes. However, every increase or decrease of temperature is associated with some change in the state or condition of the central regulating center. This central apparatus preserves the heat of the body by stimulating chemical heat production in the muscle and liver, by the regulation of the circulation (blood) in the skin, by the control of the respiratory activity and of the sweat secretion. The heat center in the brain probably consists of two components, which are antagonistic to each other, and hold each other in a state of equilibrium, so that one might say that there is a heat and a cold center.

These centers can only temporarily be influenced by irritations arising in the periphery—cold stimulating the heat center and heat stimulating the cold center. This action often takes place, when only a cooling or a heating of the surface is threatened.

These centers may also be directly influenced both by substances circulating in the blood and by changes of temperature of the blood itself. Fever can be a cause or a result of irritability of the heat center, as well as the result of the inhibition of the cold-producing center. The heat-producing center may be stimulated by cold, electrically, mechanically, and especially chemically. It is due to the later action that a foreign albumin present in the circulation causes an elevation of temperature.

Two groups of substances influence the temperature. The first group, as cocaine, adrenalin, etc., influences the heat-produc-

ing center; the other group, to which aconite, digitalin, etc., belong, influences the cold-producing center.

The heat-producing center of one suffering from fever reacts quicker to abnormal influences than does the heat center of a healthy man; therefore it is for this reason that a cold bath quickly reduces the temperature of a person suffering from fever, while it has hardly if any influence on the temperature of a healthy person.

The heat center is paralyzed through large doses of quinine, antifebrin, antipyrin, or is dulled through the soporifics, morphine, chloral, alcohol, etc. The temperature in a healthy person also falls on the use of a cold bath.

However, for the control of fever these products hardly come into consideration. With the idea which has long been held, that a moderate degree of fever is of value for the well-being of the organism, Meyer agrees. but holds that high degrees are destructive and must be combated.

Krehl, of Heidelberg, who followed Meyer, agreed with the majority of Meyer's statements. The body does not have an absolute unchangeable temperature. As is known, the daily temperature varies slightly, according to the manner of life, etc. Krehl thinks that fever is due to an irritation of the heat-producing center, which reacts as to strength and persistency according to the type of the irritation. In regard to the source of the heat production, Krehl does not believe that it is due to an increased destruction of albumin. The metabolic changes of a person suffering from fever is not greater than are those of an undernourished person. The giving off of heat does not play in fever the rôle which formerly it was supposed to have; its relation is in general not different from that in the normal person.

Fever accordingly appears to be due to an irritation of the heat-producing center. For the heat production the muscles (which form 40 per cent of the body weight) play a great rôle. Formerly it was also thought that the muscles supplied most of the heat in fever, but now it is known that the liver is most active when it contains a certain percentage of glycogen. The nervous system also plays a great rôle in heat regulation. The restraint of the excretion of sugar by a diabetic who has fever is an indication of the association of the sympathetic system in fever production. However, the glands with internal secretion seem to have a most marked influence over the heat regulation. The procedure is probably as follows:

The irritation produced at different places in the body is carried to the heat center; from here stimuli are carried through the sympathetic system to the glands (with internal secretion). In these glands stimuli then arise which are carried to and influence the body cells.

In treating fever it is not the fever itself which is to be treated, but the process. The chief rôle is played by the nutrition. Albumin should be given in only very small amounts. Carbohydrates on the contrary should be given in considerable quantities, because they can be made more appetizing and will be better taken by those who have no appetite. They also do not remain so long in the stomach as the albuminous foods. The nourishment should be ample and sufficient. Baths should also be used. Medicines, however, should be used only to quiet the heat-producing center and not be given to lower the temperature.

Krehl has good results in treating typhoid with small doses of pyramidon.

In connection with the preceding addresses in regard to fever was that of Professor Schittenhelm (Königsberg) in regard to the relationship between anaphylaxis and fever.

If albumin or other substances are injected into a vein, and in fourteen days the injection is repeated, certain symptoms appear, such as a fall of temperature, cramps, difficulty in breathing. If the course is more chronic there occur fever, increase of the white blood-cells, decrease of the blood-pressure, increase in the rate of flow of the lymph streams, increase of the clotting power, etc. The cause of these phenomena is probably a poisonous substance which in

the neighborhood of the intestinal canal is split off from albumin by a specific action of a ferment which is circulating in the blood. However, the poisonous properties of this product are not so great that it can explain the severe symptoms which are present. Anaphylaxis has also been given as an explanation of fever, for it has been found that from all bacterial albumin an albuminous body may be found which is identical with that produced by the breaking up of the proteids. One must also accept the fact that there are numerous poisons causing fever which can arise from albumin. For a complete explanation of anaphylaxis, one must also call upon certain physical phenomena such as disturbances in the colloidal equilibrium of the blood and the tissue juices, which also may produce symptoms similar to those which appear in anaphylaxis.

In the discussion of the previous papers, v. Müller (München) and Kraus (Berlin) contested the statement of Krehl that fever is not associated with an increased destruction of albumin. Kraus supported himself especially on the results of new experiments by Hirsch.

Jaksch, of Prague, warned against baths in typhoid fever and recommended rubbing. He also advised against the use of fever remedies and alcohol in typhoid fever.

Haupt (Soden) conducted the symposium in regard to temperature observations with constant temperature-recording apparatus. The temperature was taken in the rectum every two minutes and recorded for twenty-four hours. It showed the action of different remedies on the temperature. It also showed that a fall of temperature is not necessarily synchronous with sweating, that the evening temperature is very easily influenced, and that it is at this time that one should especially watch for the influence of tuberculin.

Pfeiffer, of Wiesbaden, spoke of the fever in gout. In the acute attacks of gout the temperature in the axilla is almost without exception exactly 38.2° C. or 38.3° C., and only rises in chronic gout sufferers in whom there is much gouty deposit or in whom many joints are simultaneously affected, or in whom complications have occurred.

A second characteristic of the fever of gout is that it is influenced by remedies which otherwise are not fever remedies, such as colchicum, and the remedy known as the Liqueur de Laville, while quinine is without influence.

The discussion in regard to the diseases of the digestive organs was introduced by Professor Goldman (Freiburg) by an address, "The digestive apparatus in the light of living color." By living or vital color is meant a method in which the coloring matter of living animals is injected under the skin or into the circulation, and by which the combination of the coloring matter with the body cells and the persistence of the coloring matter in them may be followed. Ehrlich has used this method for the study of the formation of the nervous system.

Goldman studied the retention of the coloring matter which had been injected into different animals, as rats, etc., in regard to its effect on the alimentary canal. In a rat which is examined at the height of digestion the different parts of the alimentary canal have different relationships. The esophagus is almost entirely without color, the entrance to the stomach is likewise colorless, while the pylorus (gland-containing part) is deeply colored. The duodenum and the upper part of the jejunum is colored; the color diminishes in the region of the cecum and again increases in the upper part of the colon. The color depends upon a certain sort of vitally colored cells which are loaded to a greater or less degree with coloring matter. These cells possess a great power of wandering about; they are very easily attracted (chemotactic), and are characterized as eating cells (scavengers)—*i. e.*, cells which are capable of taking in strange particles and modifying them. These cells are most numerous in the meshwork of the mucous membrane of the intestinal canal. They are in constant movement, so that no part of the intestine is free of them. In states

of hunger they are very scarce. These wandering phagocytes do not originate in the blood nor in the intestinal canal itself; although their chief place of formation is the mesentery, one also finds them in the spleen and the lymph glands. The process of digestion is also characterized by the entrance of these cells rich in the products of digestion into the intestinal walls, and after giving up their contents they again return to the intestine. The lymph glands lying behind the cecum and the spleen also take part in this process. They are also present in the spleen. Formerly it was thought that in the spleen the red blood-cells were only destroyed, but now it appears that in this process an important substance is set free which is taken up by the phagocytes and is very important for the digestive processes. The digestive process progresses simultaneously with a cell reaction which is taking place in the mucous membrane, which is characterized by the appearance of the so-called free wandering cells.

A rat infected with trichina showed the wandering cells gathered together into groups around each individual trichina capsule; they were likewise found in the neighborhood of a cancer nodule in a case of peritoneal carcinoma in a mouse.

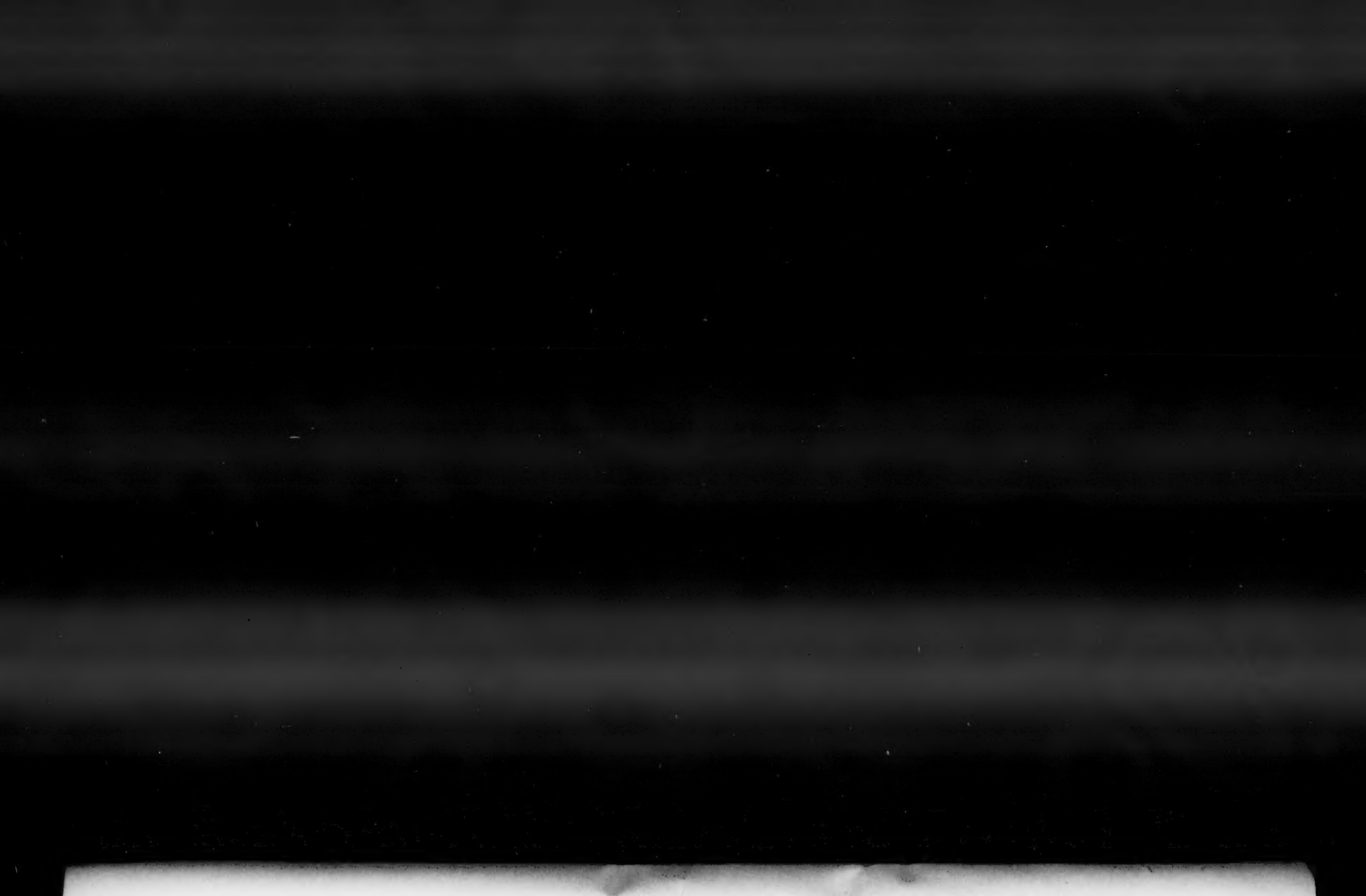
Friederich, of Königsberg, reported on similar conditions which he had found in the pleura and lungs.

On April 16 a very interesting address was delivered by Jockman, of Berlin, on "Salvarsan in Scarlet Fever." He confirmed the good results which he had reported to a former Congress. He had treated in Virchow Hospital in Berlin 117 cases of scarlet fever with small doses of salvarsan, 0.1 gramme to 10 kilogrammes of weight, and has derived the impression that the general condition, especially in severe comatose patients, was very favorably influenced. Its great advantage lies in the favorable influence which it has on the swelling in the neck. Out of twenty-five of these cases twenty-four were promptly improved, in that the membrane was quickly cleaned off and disappeared and the swelling went down. In four cases whose prognosis was absolutely unfavorable, three were saved. Out of 51 cases in which the prognosis was doubtful, only three died. Schreiber (Magdeburg) confirmed likewise the favorable influence, and recommended salvarsan especially for the processes in the neck.

Following this discussion came that in reference to diseases of metabolism. Reicher, of Bad Mergentheim, discussed fat metabolism in diabetes. Of especial interest was the address of Luthje, of Kiel, on the "Therapy of Diabetes." In the clinic at Kiel in a short time the use of enemas of sugar solution has become more general; they must be given in the form of drop-enemas. By this means it is possible almost without exception, without trouble, and without irritative symptoms on the part of the intestine, to introduce 50 to 100 grammes per day. It always shows itself of especial value to be able to introduce into the intestine an amount of grape-sugar equivalent to the loss.

NOTES AND QUERIES.

IN PRAISE OF THE PHYSICIAN.

Under this title the *British Medical Journal* of March 8, 1913, says that in modern times there have been many appreciations of the physician both in verse and prose. Every one, for instance, knows Henley's lines on Lord Lister when he was in the Edinburgh Royal Infirmary; but Crabbe's verses in "The Village" may be less familiar, whilst they are no less appreciative, and indeed contain phrases which possess almost prophetic force. To the profession he sings:

Glorious your aim—to ease the labouring heart,
To war with death, and stop his flying dart;
To trace the source whence the fierce contest grew,
And life's short lease on easier terms renew;
To calm the frenzy of the burning brain,
And heal the tortures of imploring pain;
Or, when more powerful ills all efforts brave,
To ease the victim no device can save,
And smooth the stormy passage to the grave.